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Beidokhti

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(54) **MULTI-SPRAY MULTI-LIGHT FOUNTAIN**

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F21S 8/00 (2006.01)

(52) **U.S. Cl.** **239/18**; 239/17; 239/20; 239/16; 362/96; 362/101; 362/268; 362/373

(58) **Field of Classification Search** .... 239/18, 239/17, 16, 20, 23, DIG. 15; 362/96, 101, 362/267, 268, 373, 362, 293
See application file for complete search history.

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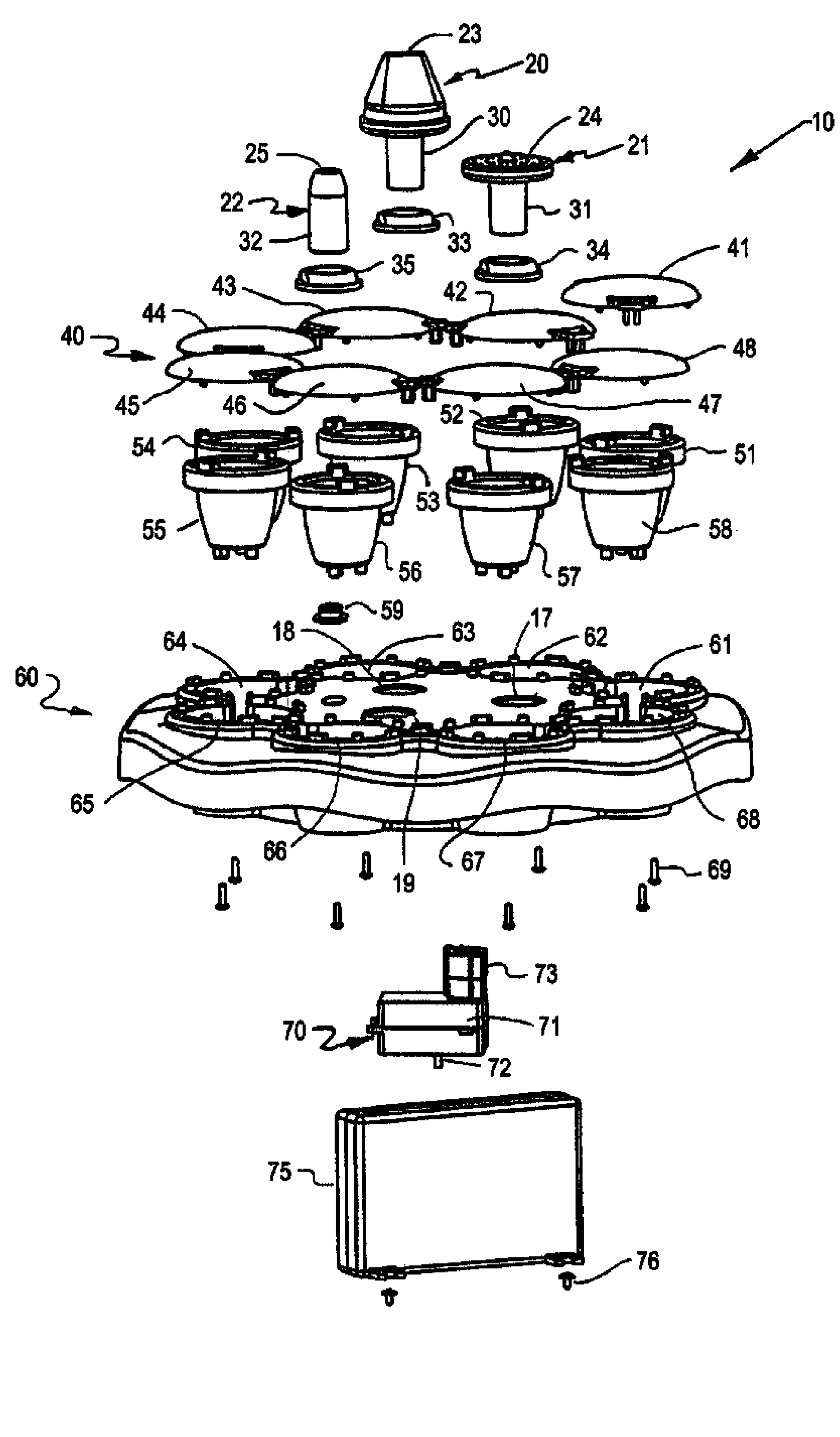
(57) **ABSTRACT**

A housing suitable for partial immersion in a pool or pond supports a plurality of electric lamps together with a plurality of fountain nozzles. The fountain nozzles are coupled to a nozzle flow distributor which is operative to direct water flow to one or more of the nozzles selectively. The directing of flow is accomplished by a motor-driven flow distributor operative under an electric module control. A plurality of electric lamps are supported within respective lamp assembly receptacles which in turn provide a flow of cooling water to maintain the lamp assemblies at a safe operating temperature.

15 Claims, 18 Drawing Sheets



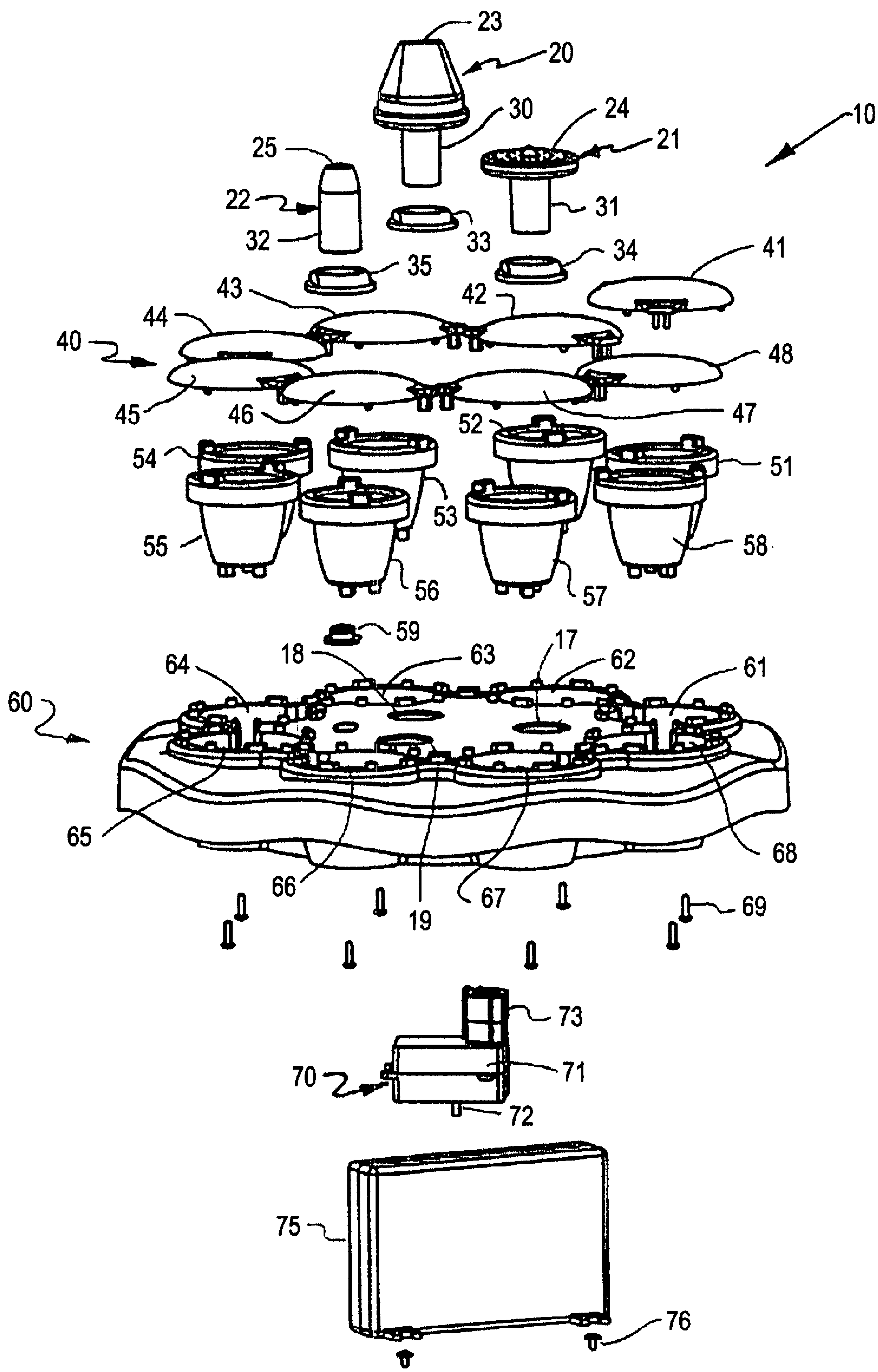

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FIG 1A

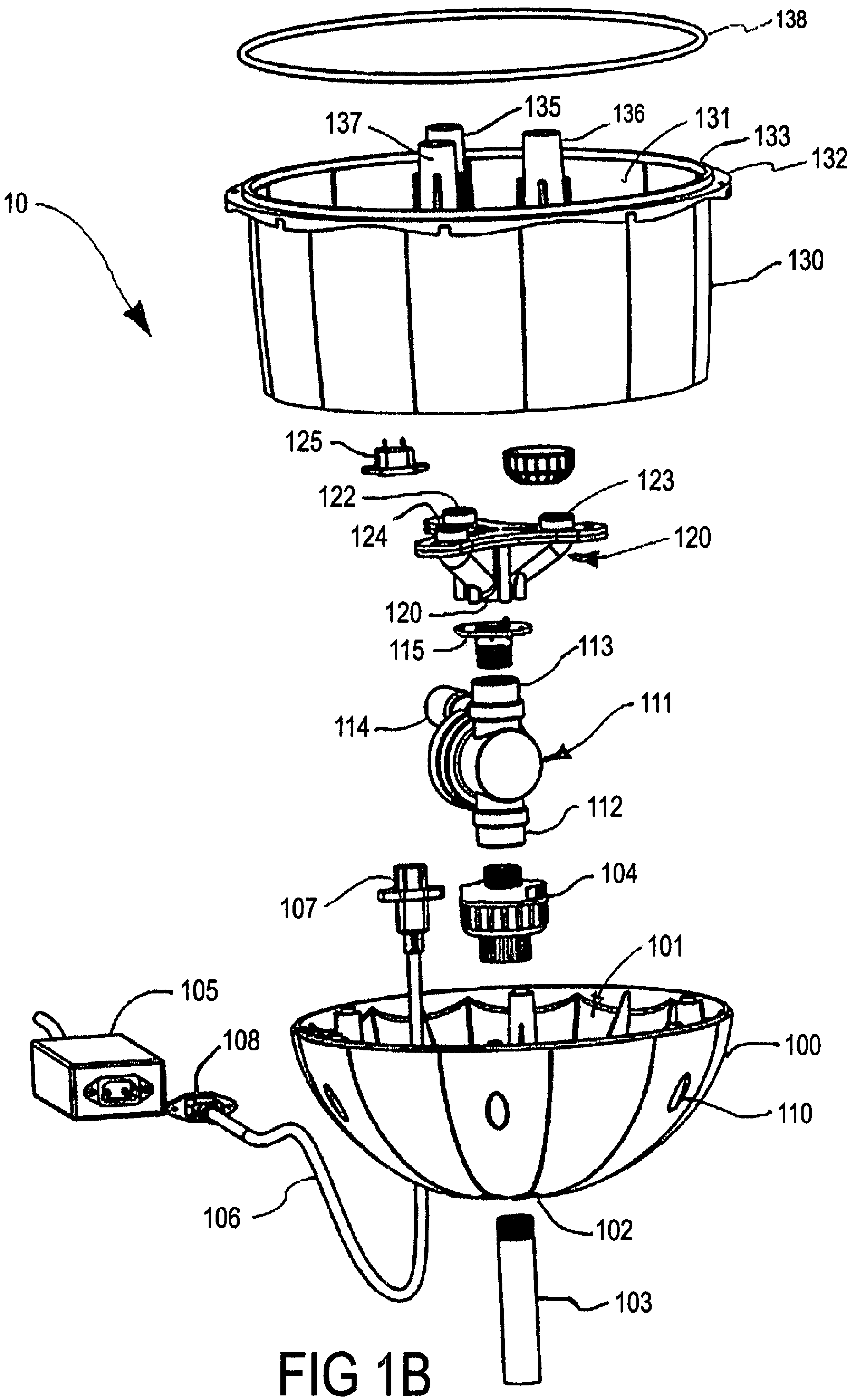
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FIG 1B

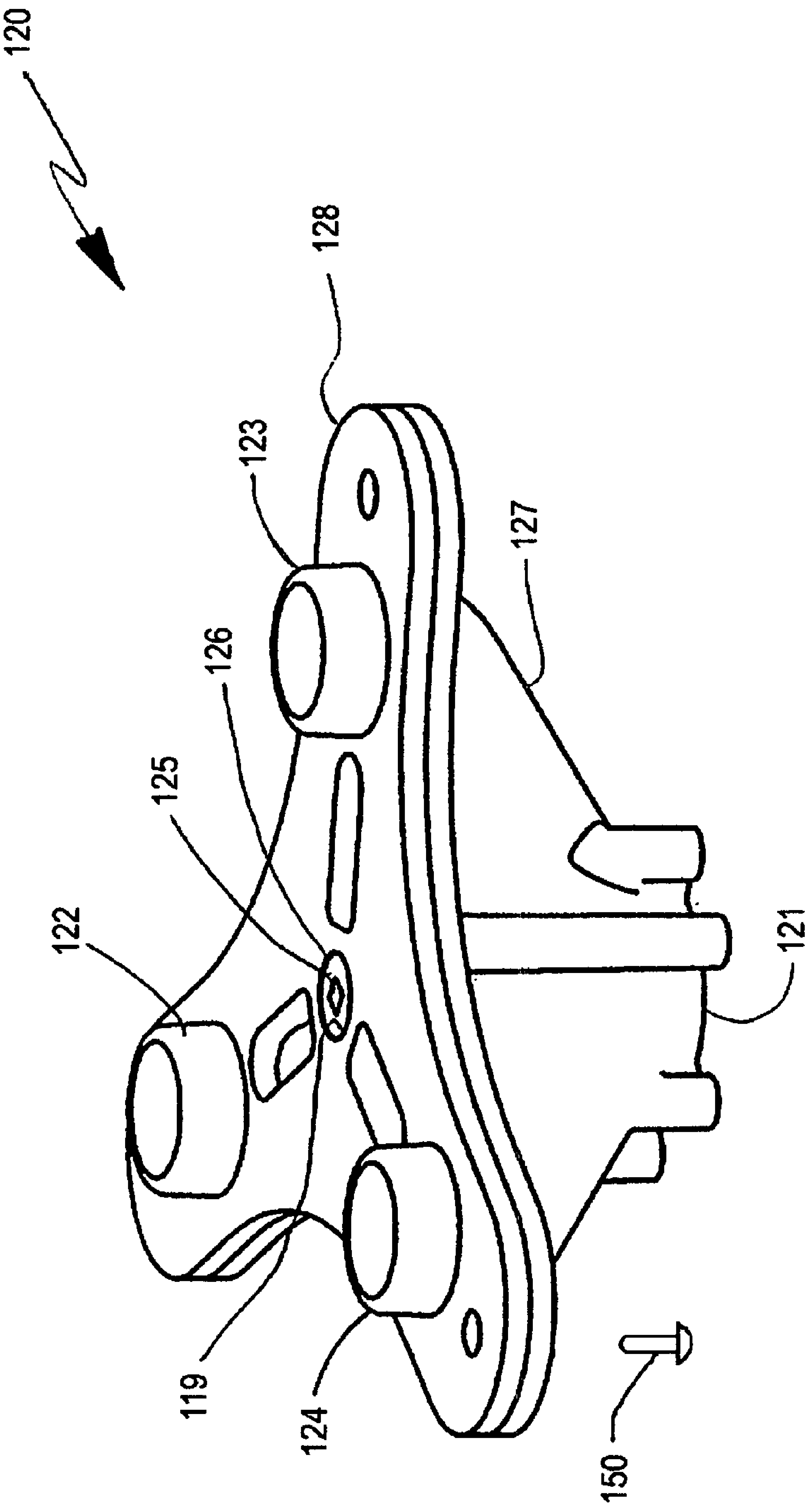

FIG 2

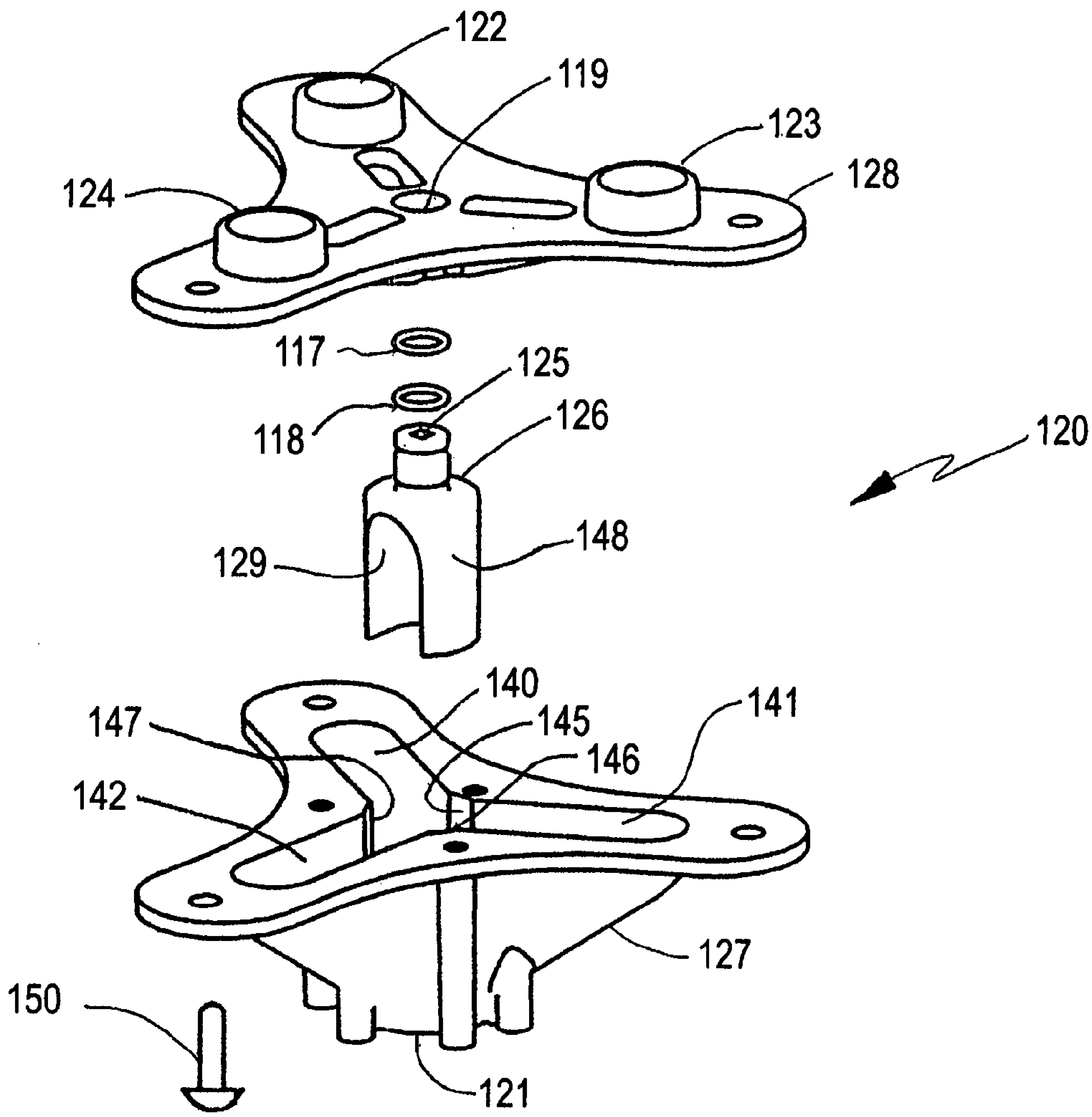
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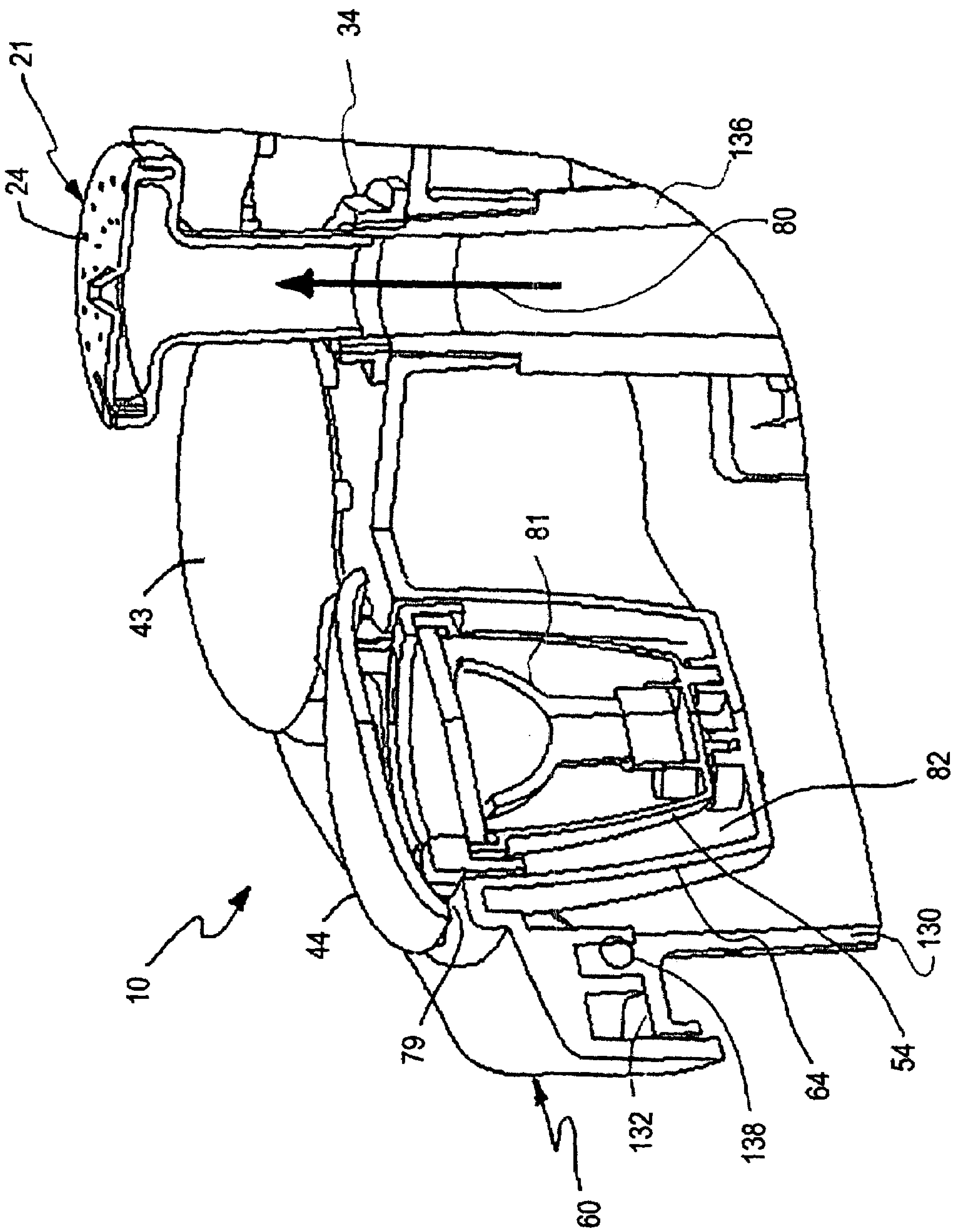
FIG 3



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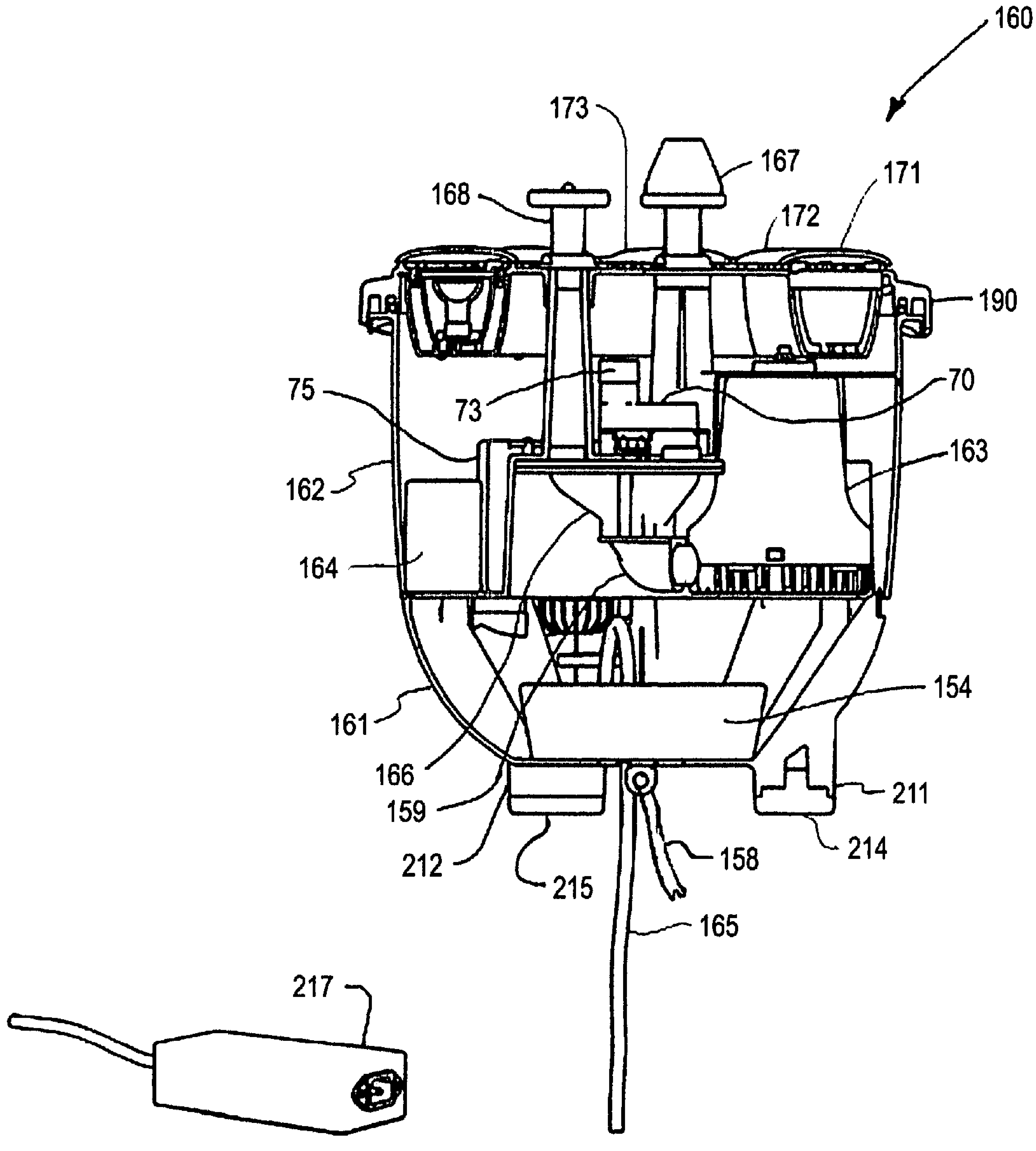
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FIG 5

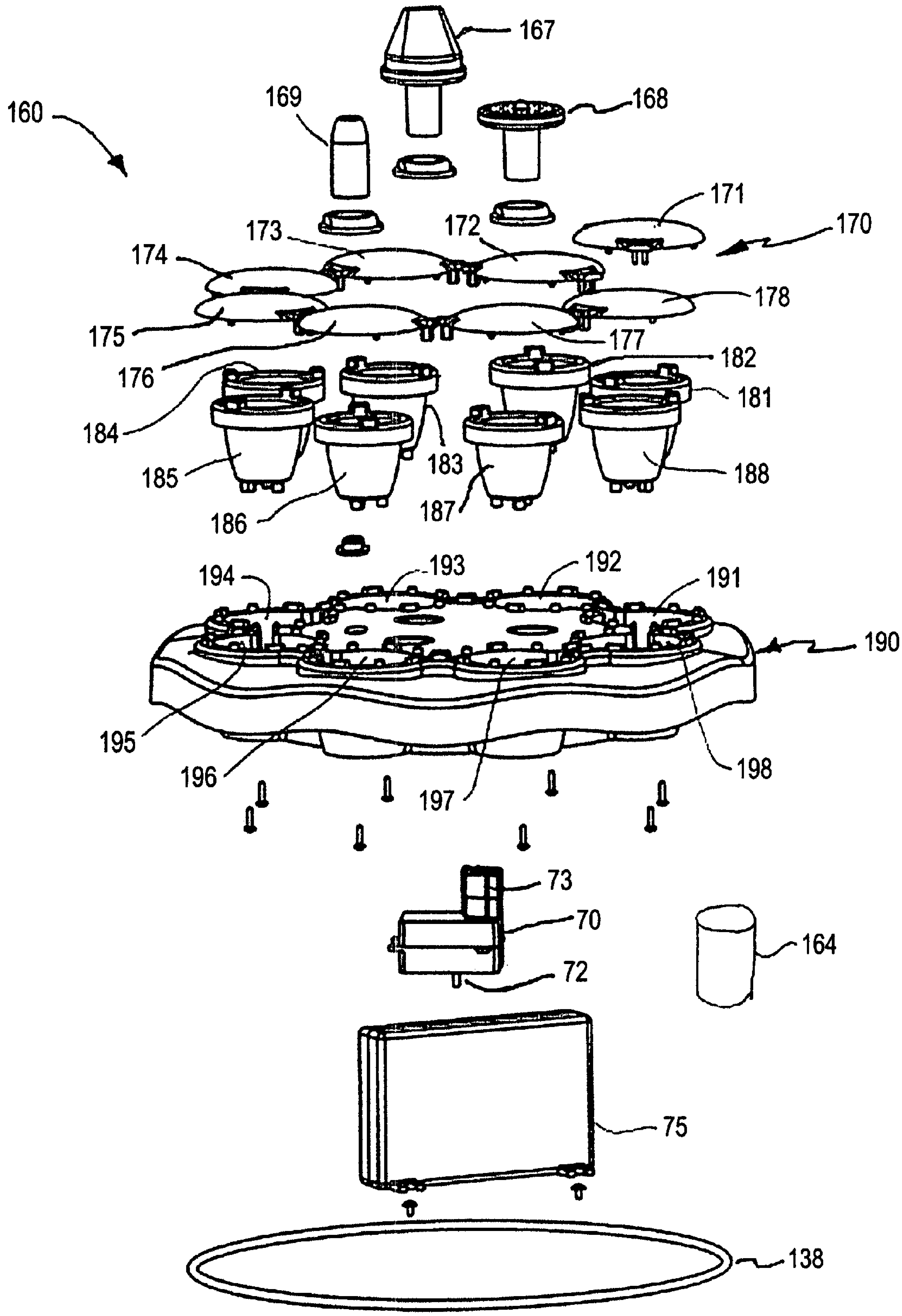
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FIG 6A

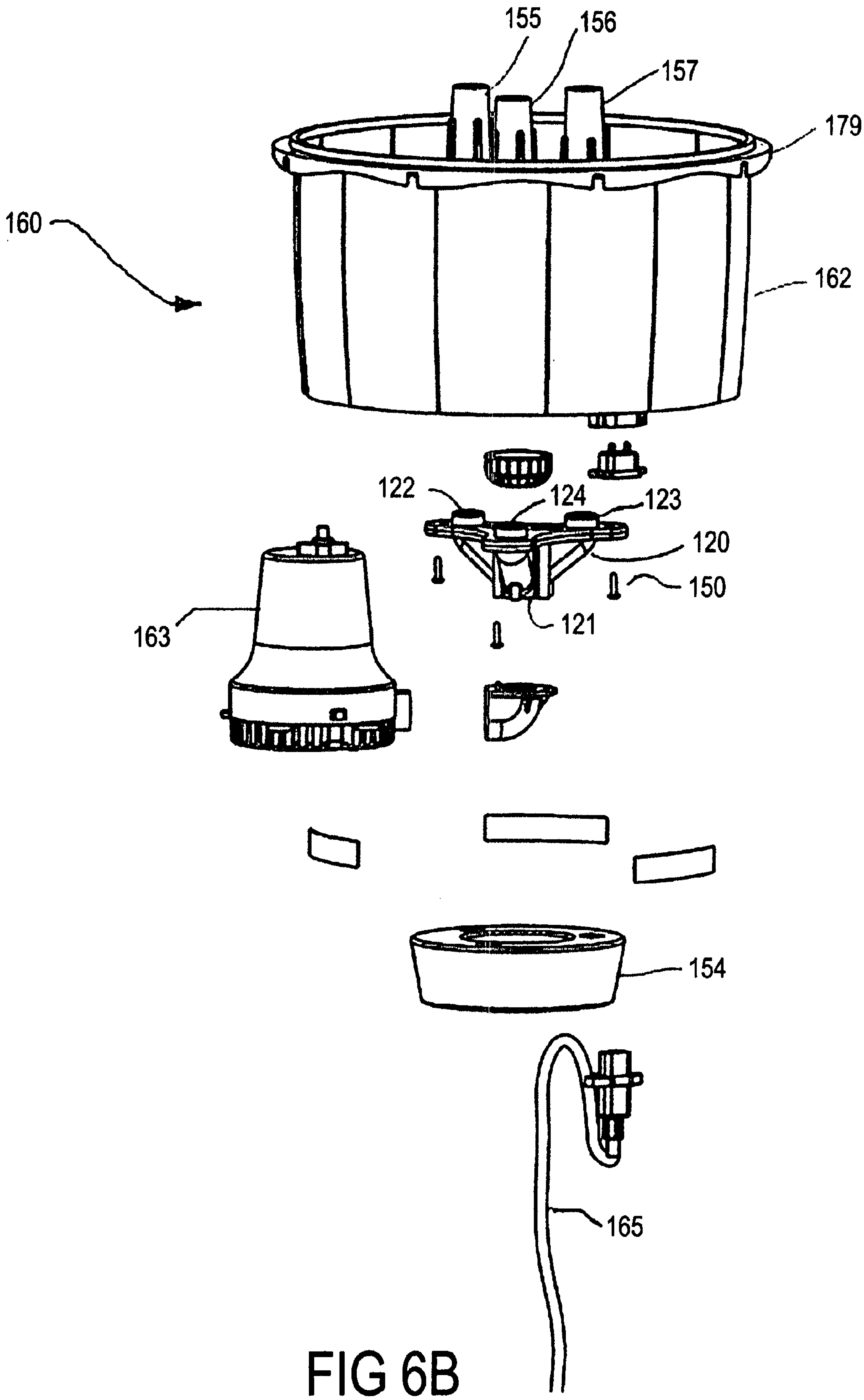

FIG 6B

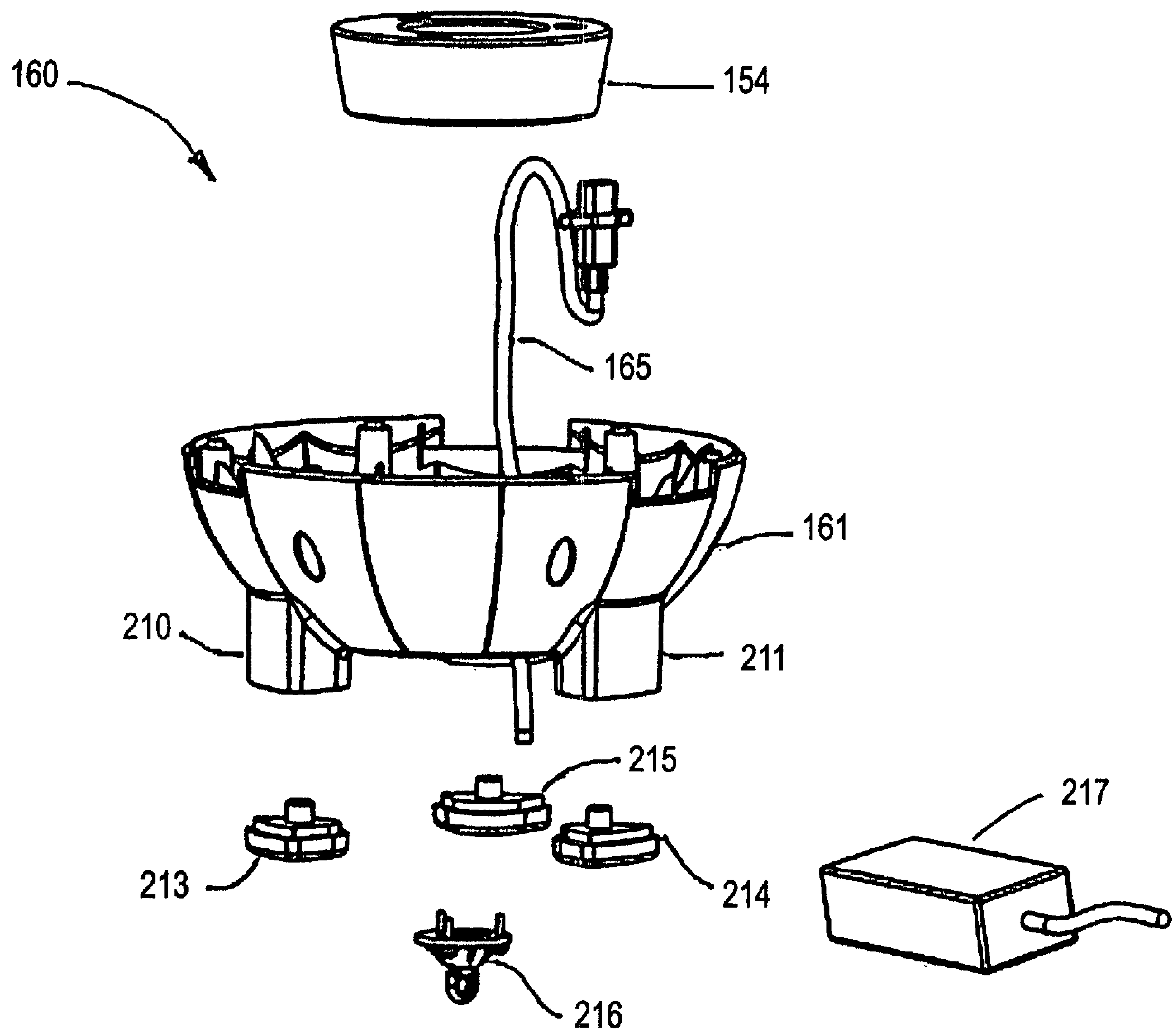

FIG 6C

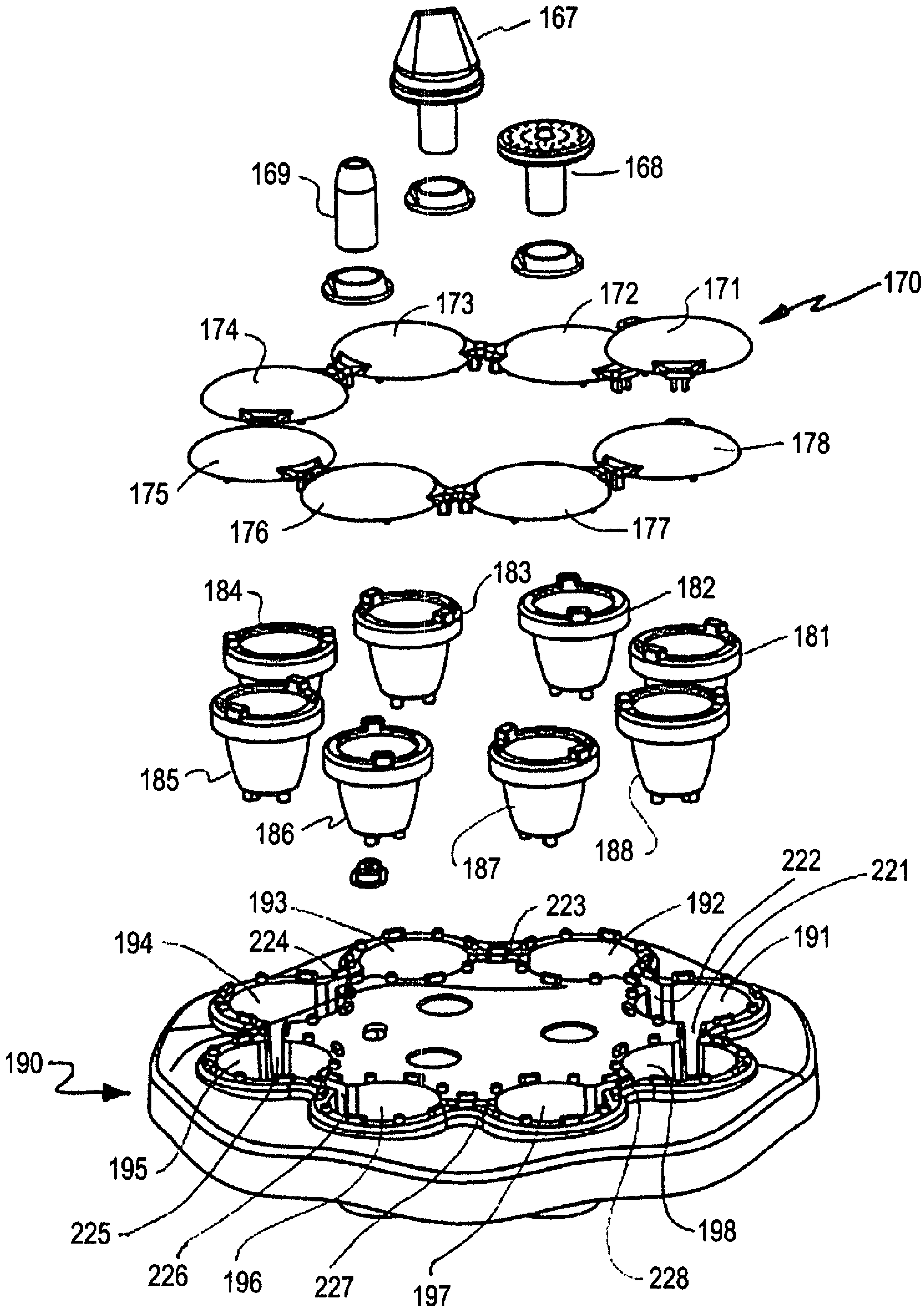
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FIG 7

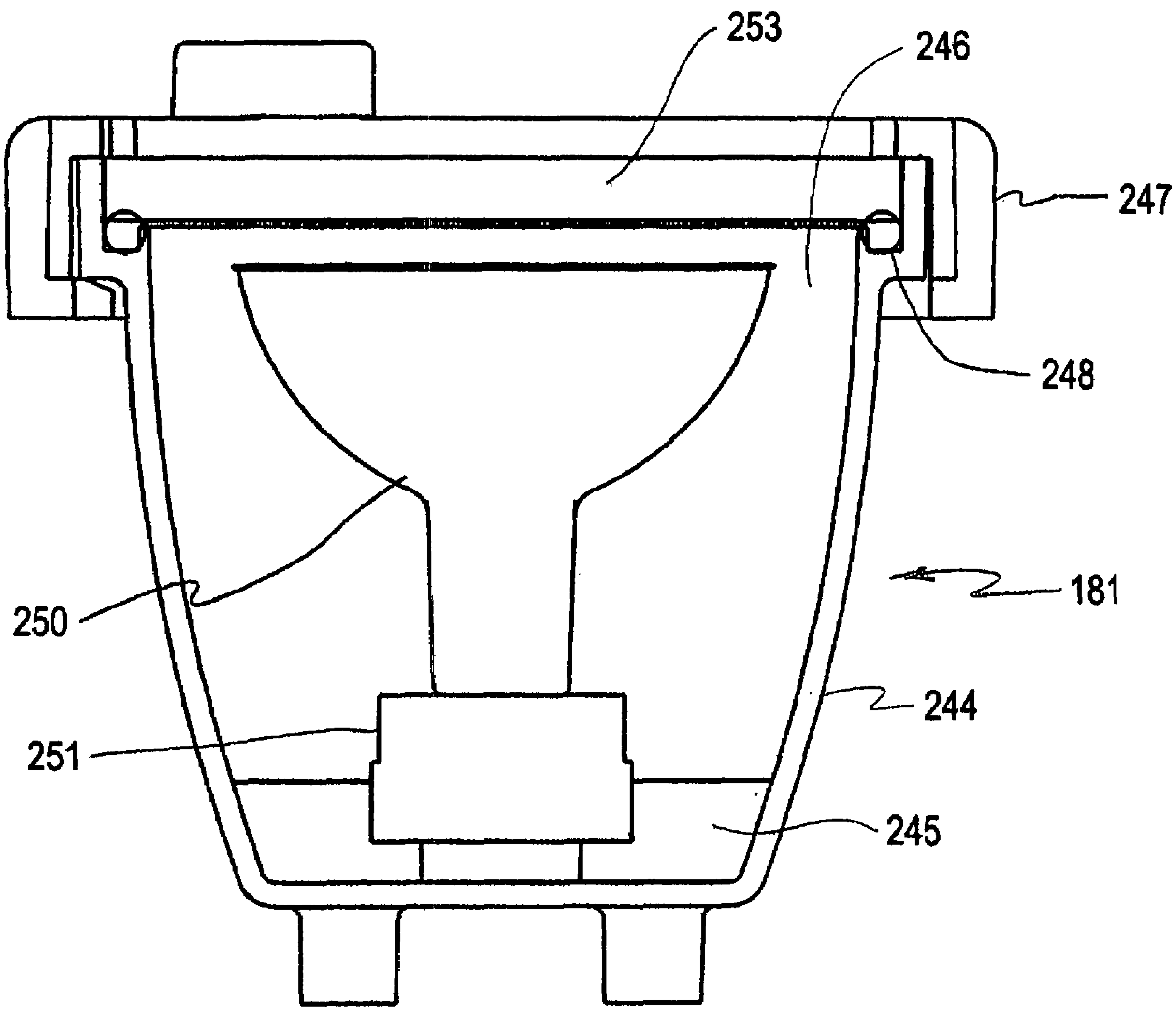
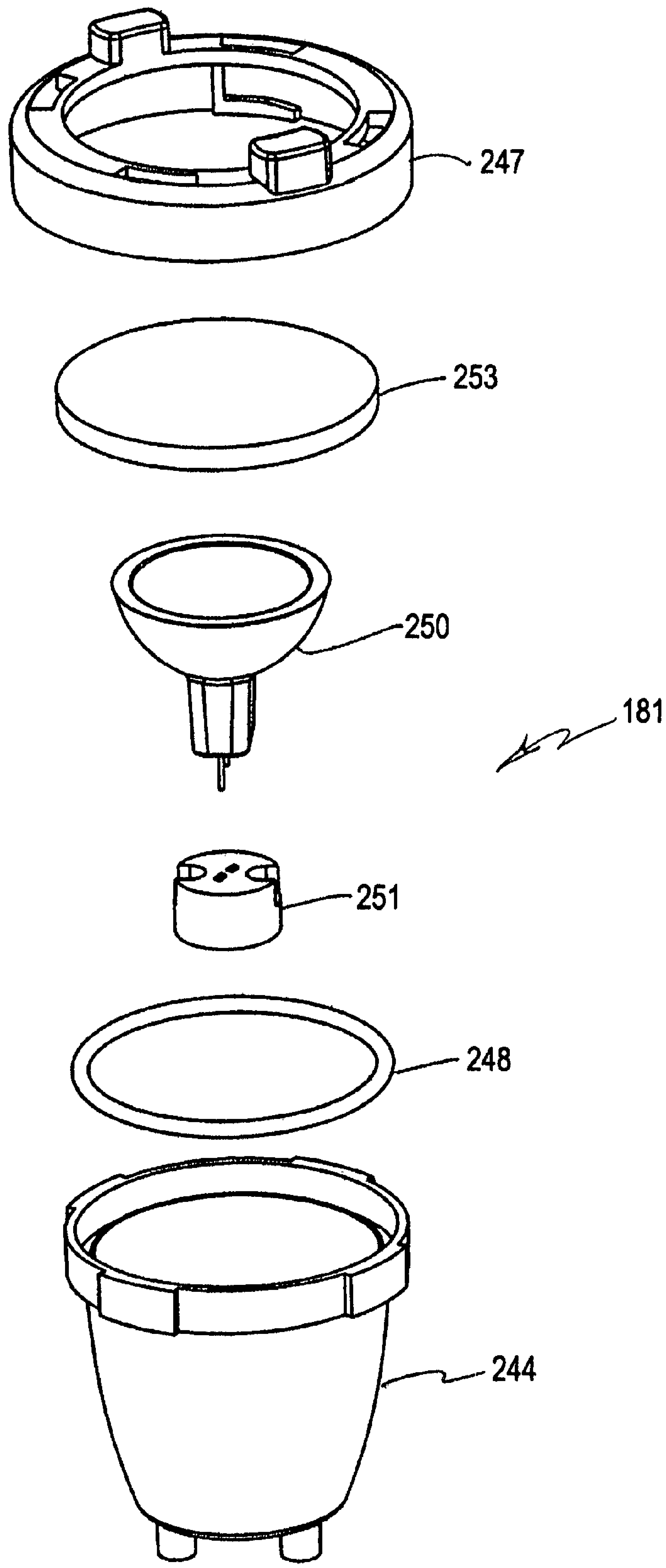


FIG 8



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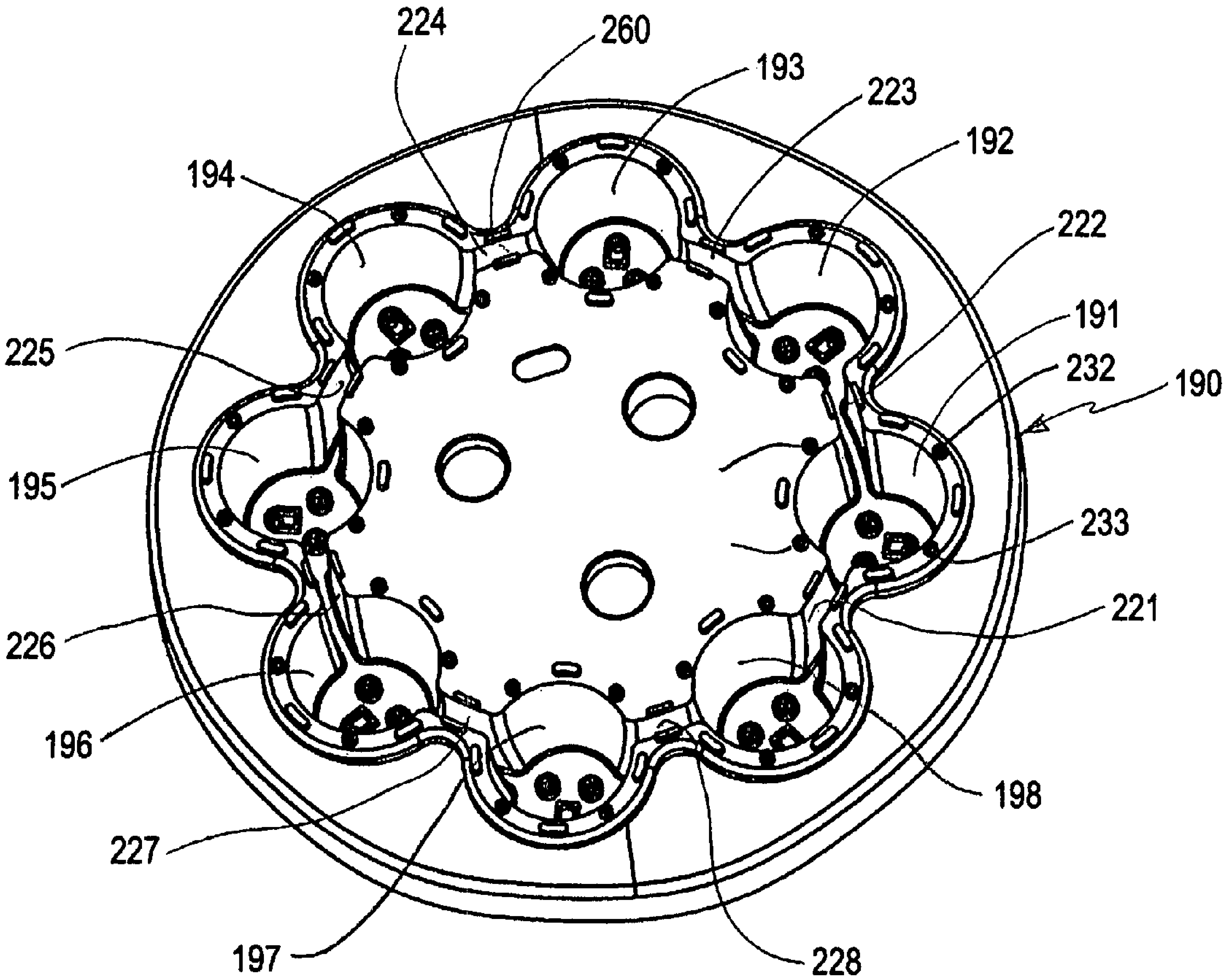
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FIG 10

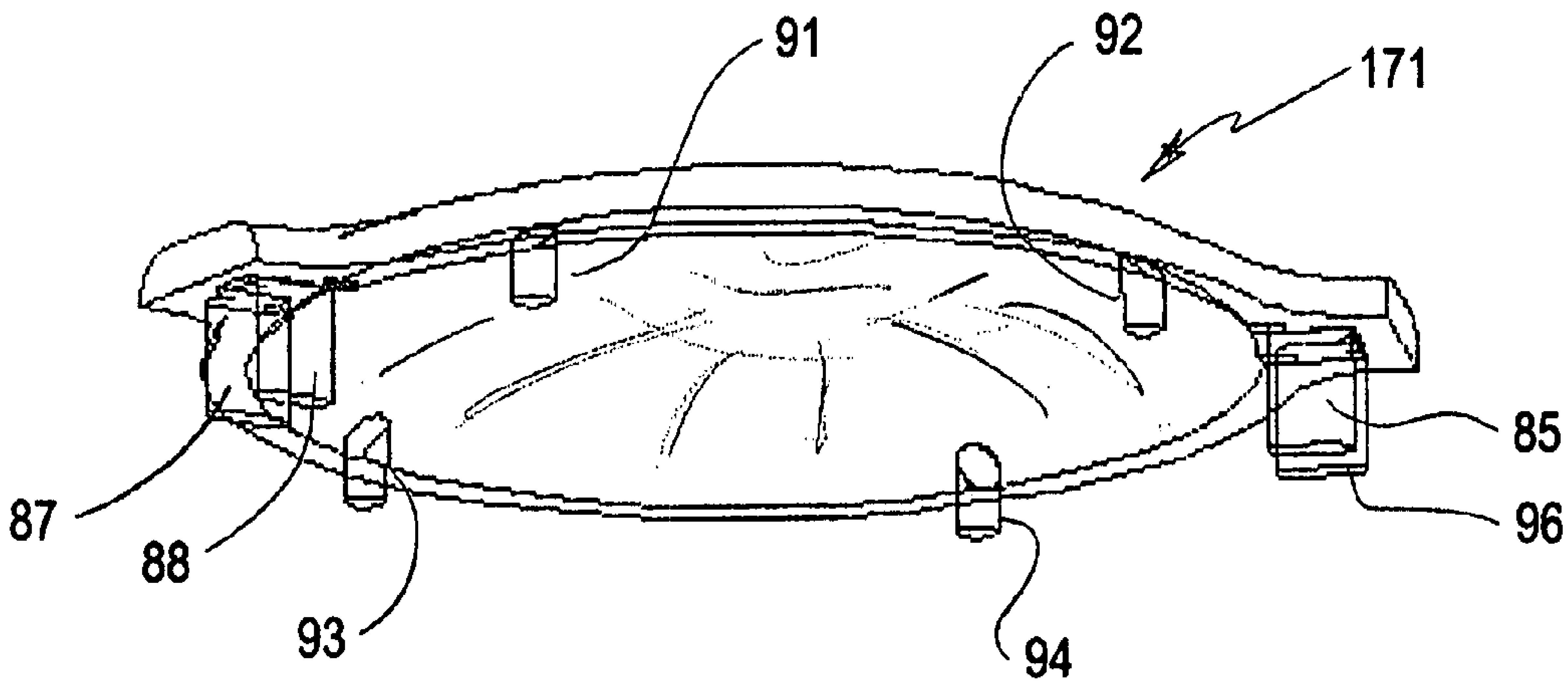

FIG 11

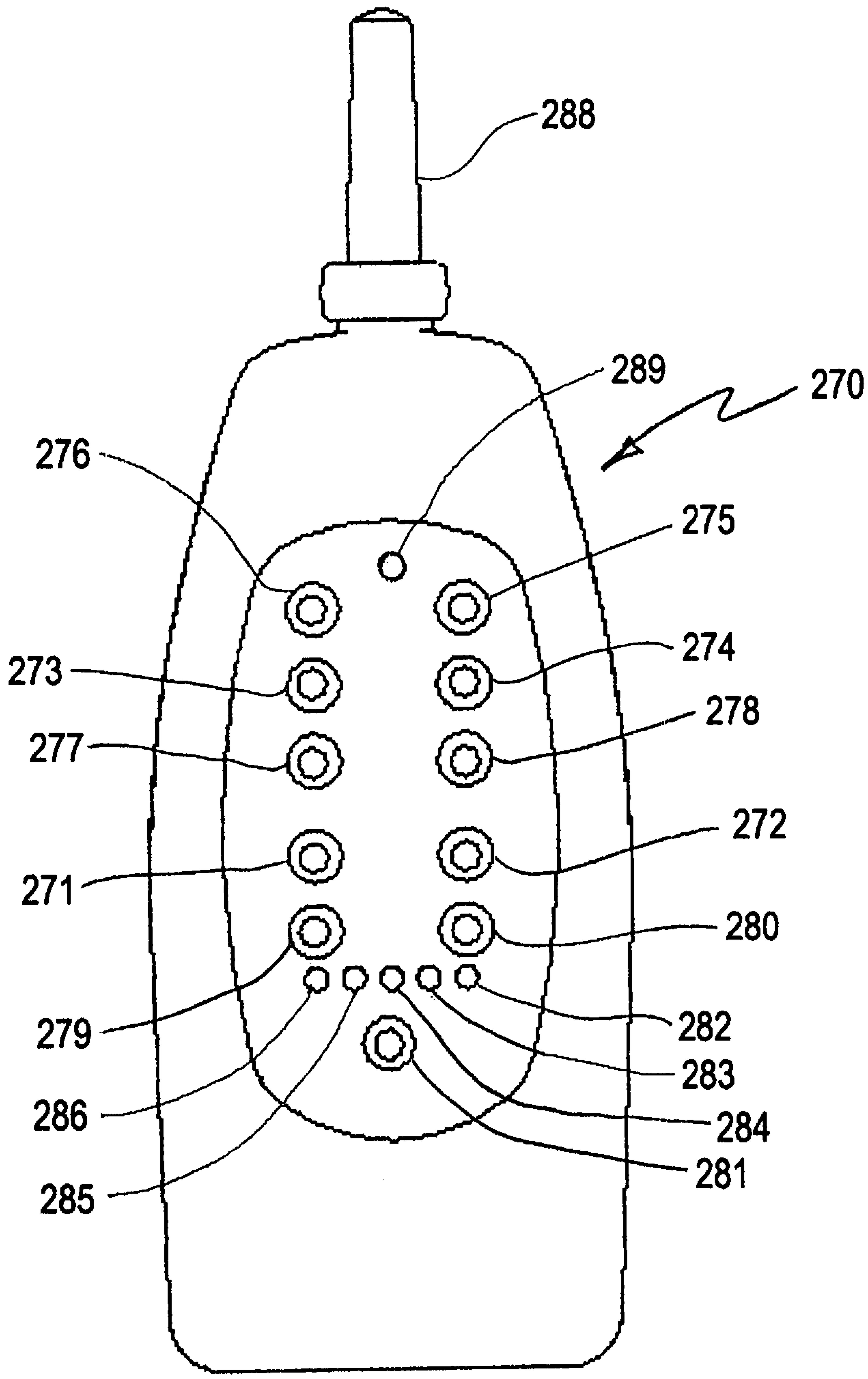
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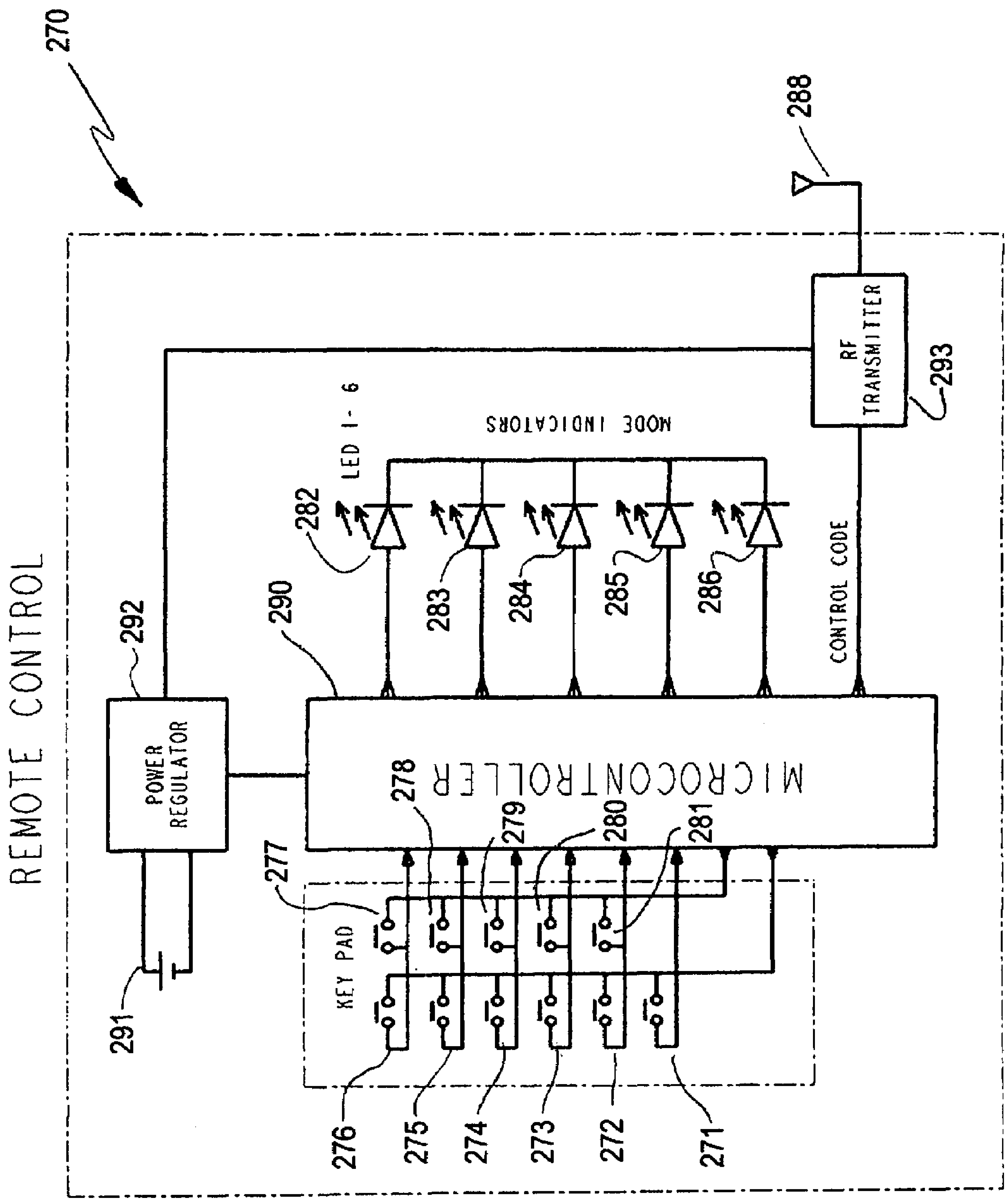
FIG 12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REMOTE CONTROL
POWER REGULATOR
292
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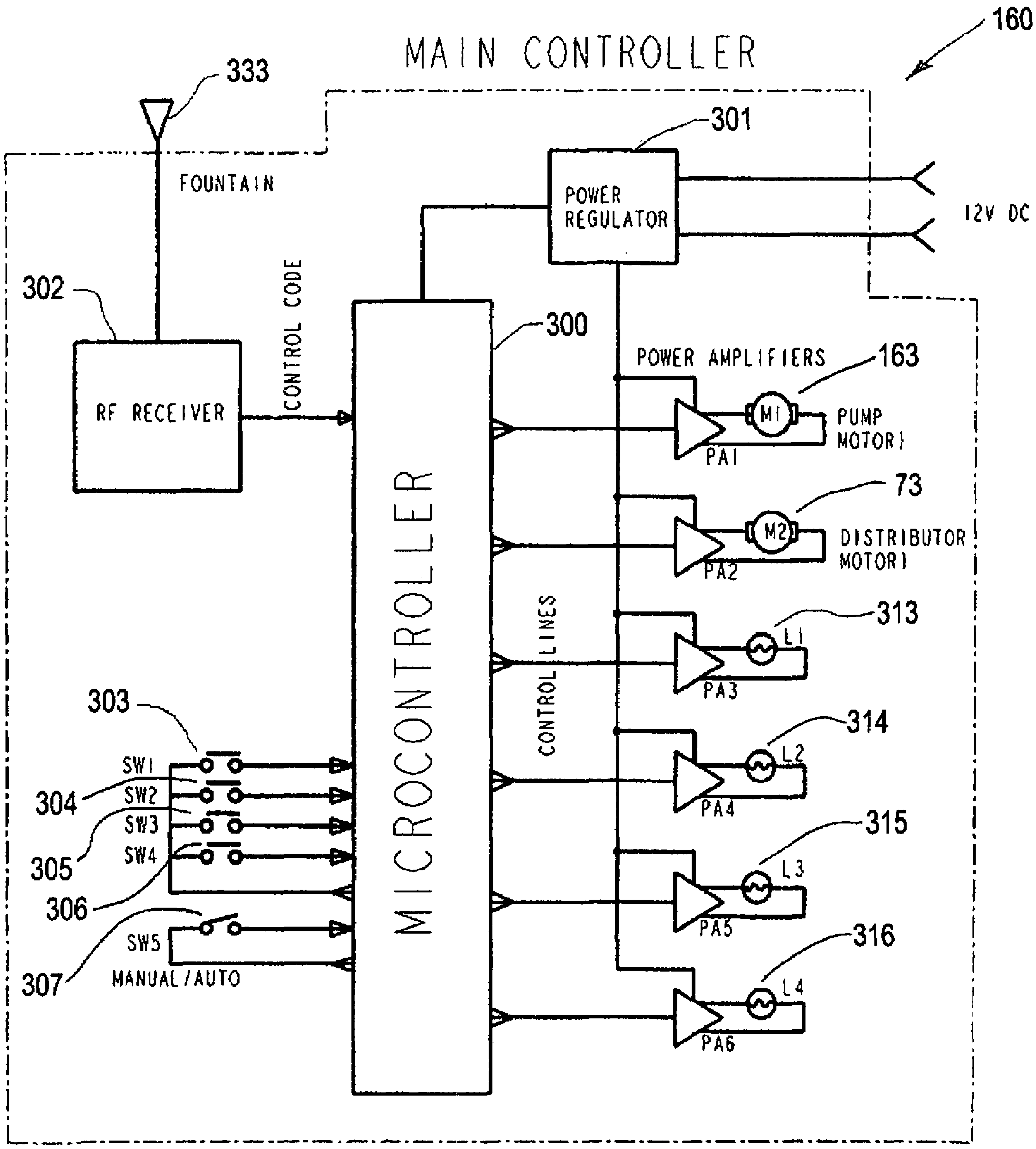
MICROCONTROLLER
290
KEY PAD
277
278
279
280
281
276
275
274
273
272
271
282
283
284
285
286
LED 1 - 6
MODE INDICATORS
CONTROL CODE
RF TRANSMITTER
293
288

FIG 13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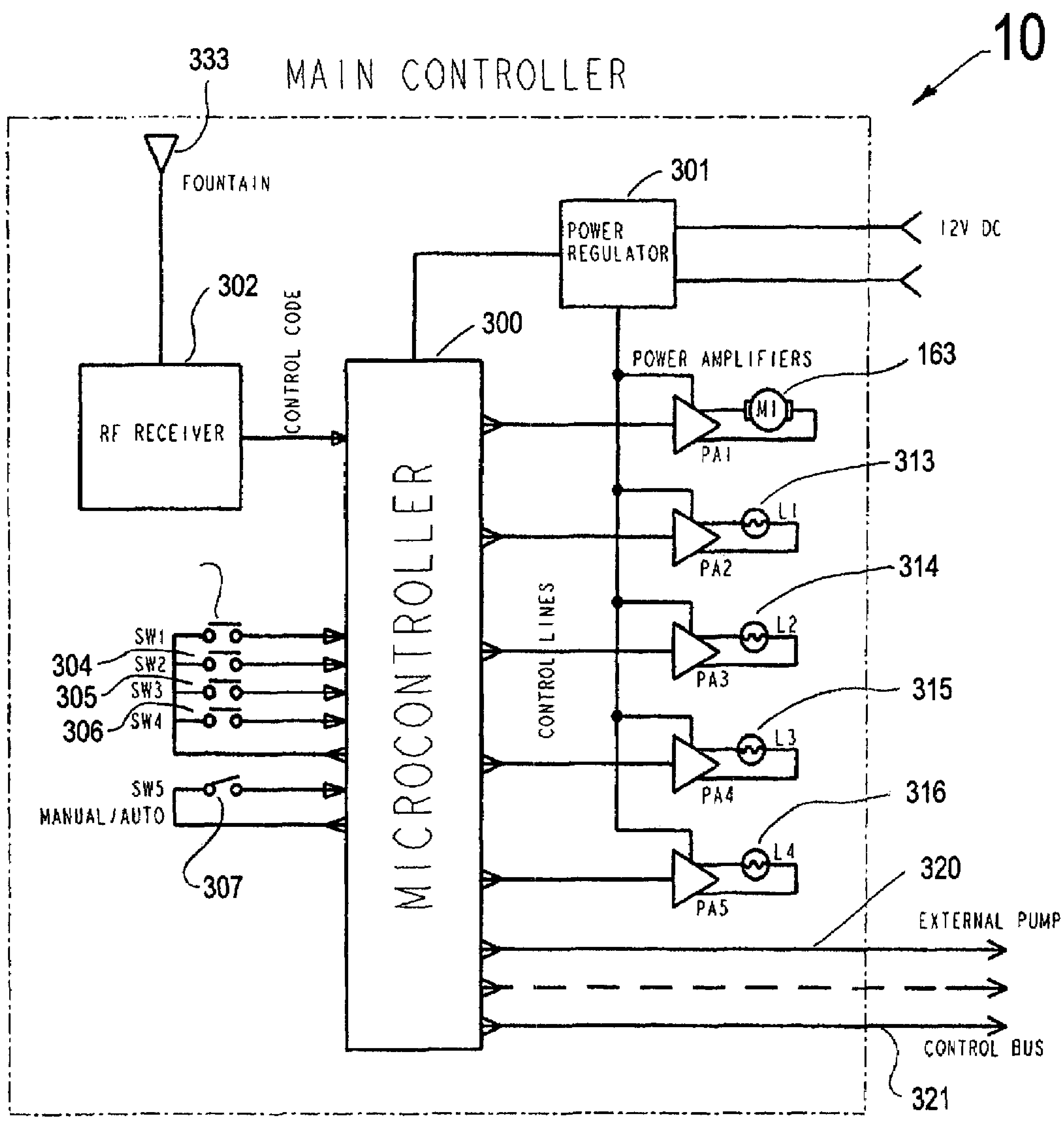
163
M1
PUMP MOTOR1
PA1
73
M2
DISTRIBUTOR MOTOR1
PA2
313
L1
PA3
CONTROL LINES
314
L2
PA4
315
L3
PA5
316
L4
PA6
303
304
305
306
307
SW1
SW2
SW3
SW4
SW5
MANUAL/AUTO

FIG 14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L1
PA2
MICROCONTROLLER
CONTROL LINES
314
L2
PA3
SW1
SW2
SW3
SW4
304
305
306
315
L3
PA4
SW5
MANUAL/AUTO
316
L4
PA5
307
320
EXTERNAL PUMP
CONTROL BUS
321

FIG 15

MULTI-SPRAY MULTI-LIGHT FOUNTAIN

FIELD OF THE INVENTION

This invention relates generally to fountains and particularly to improved fountain systems which utilize one or more electrically driven pumps to provide pressurized fountain sprays of water or other liquids.

BACKGROUND OF THE INVENTION

The general concept of fountains and fountain displays is well established in the art. Fountains have exsisted from earliest recorded history and have been the subject of substantial creativity and artistic expression. Thus, early fountains were often intricately sculptured and replete with various sculpted figures and sculpted objects. Earliest fountains were typically gravity powered in that water from a higher location was allowed to flow downwardly across the fountain structure in what is generally describable as a cascade. With the advent of pumping devices, some of which were human or animal powered while others were driven by wind power apparatus, fountains and fountain displays obtain the added feature of water sprays or streams of upwardly or angularly directed water under pressure. Practitioners in the art placed considerable emphasis upon creativity in providing aesthetically pleasing flow patterns of sprays and water streams.

As electrical pumps and electrical control systems became generally available, practitioners in the art provided ever more complex displays and fountain systems. Often such fountain systems employed moving nozzles to direct spray through various movement or "dancing" pattern activities. In addition, the use of electrical pumps and pump control systems provided for the additional aesthetic elements for fountain systems such as variations of fountain pressure to alter the fountain spray or water stream heights. Further development of electrical pumping systems provided for displays having multiple changing spray patterns together with multiple cascades.

The continued development of electrical pumping systems also brought added capability to fountains. Basically, fountains were now able to incorporate different types of cleaning and filtering apparatus as a quantity of water is circulated in a closed circulation system through the fountain. The implementation of electronic controllers to further control electrical pumping systems within fountains added further flexibility and capability. Additional elements such as light and sound features provided still further creativity for fountains and fountain displays.

As a result of substantial development in the art, modern fountains have become available in sizes ranging from simple small fountains suitable for a residence or small housing complex to large and complex fountains and fountain displays suitable for public parties or entertainment facilities.

Despite the substantial effort and improvement by practitioners in the art in creating ever more improved fountains and fountain systems, there remains nonetheless a continuing need in the art for ever more improved efficient and entertaining fountains and fountain display systems.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to provide an improved multi-spray multi-light fountain system. It is a more particular object of the present invention to provide an improved multi-spray multi-light fountain system which is suitable for use in environments having a ready source under pressure as well as environments requiring an on-board pump within the fountain unit. It is a still further object of the present invention to provide an improved multi-spray multi-light fountain which may be placed within an otherwise unadorned body of water such as a pond or pool and without further modification to the environment produce an entertaining and interesting fountain and light display.

In accordance with the present invention, there is provided a floating fountain for use in a water environment such as a pool or pond, the fountain comprising: a housing defining an upper edge and an interior cavity; an upper plate secured to the upper edge defining a plurality of lamp receptacles; a plurality of lamp assemblies each having a lamp housing and a lamp therein; a plurality of colored lenses and means for supporting the lenses above the upper plate in general alignment with the lamps, the colored lenses, the upper plates and the means for supporting constructed to provide a cooling water flow path into the lamp receptacles; a plurality of upwardly directed spray nozzles; and means for directing water under pressure to the spray nozzles.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings, in the several figures of which like reference numerals identify like elements and in which:

FIGS. **1**A and **1**B taken together set forth a perspective assembly view of an improved fountain constructed in accordance with the present invention suitable for use with a source of water under pressure;

FIG. **2** sets forth a perspective view of the water flow distribution apparatus used in the present invention improved fountain;

FIG. **3** sets forth a perspective assembly view of the water flow distribution unit shown in FIG. **2**;

FIG. **4** sets forth a partial section perspective view of the upper portion of the present invention improved fountain with particular attention to the light assembling cooling apparatus;

FIG. **5** sets forth a section view of an alternate embodiment of the present invention improved fountain having an on-board pump apparatus therein;

FIGS. **6**A, **6**B and **6**C taken together set forth a perspective assembly view of the alternate embodiment of the present invention improved fountain shown in FIG. **5**;

FIG. **7** sets forth an enlarged perspective assembly view of the upper plate and lamp assemblies together with nozzle assemblies of the present invention improved fountain;

FIG. **8** sets forth an enlarged section view of an exemplary light housing and water cooling apparatus therefore;

FIG. **9** sets forth a perspective assembly view of the lamp housing of FIG. **8**;

FIG. **10** sets forth an alternate perspective view of the upper plate portion of the present invention improved fountain;

FIG. **11** sets forth a lower perspective view of the under side of a typical lens element;

FIG. **12** sets forth a front view of a remote control unit constructed in accordance with the present invention;

FIG. 13 sets forth a schematic diagram of the circuit within the remote control transmitter;

FIG. 14 sets forth a circuit diagram of the main controller utilized in the embodiment of the present invention having an internal pump;

FIG. 15 sets forth a circuit diagram of the main controller of the present invention embodiment utilizing the external pump of the host pond or pool.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

FIGS. **1**A and **1**B taken together set forth a perspective assembly view of the present invention improved fountain generally referenced by numeral **10**. The upper portion of fountain **10** is shown in perspective assembly in FIG. **1**A while the lower portion thereof is set forth in perspective assembly in FIG. **1**B.

With particular attention to FIG. **1**A, fountain **10** includes an upper plate **60** preferably formed of a molded plastic material or the like which defines for the most part the upper surface of fountain **10**. Upper plate **10** is shown in greater detail in FIG. **10**. However, suffice it to note here that upper plate **60** defines a plurality of lamp receptacles **61** through **68** integrally formed within the molded plastic material of upper plate **60**. Upper plate **60** further defines a plurality of apertures **17**, **18** and **19** which are used to receive the fountain nozzles of the present invention. As is described below in greater detail, lamp receptacles **61** through **68** are interconnected by waterflow passages to facilitate the flow of cooling water in and about the lamp assemblies of the present invention.

Fountain **10** further includes a plurality of lamp assemblies **51** through **58**. Lamp assemblies **51** through **58** are set forth in greater detail in FIGS. **8** and **9** below. Suffice to note here that lamp assemblies **51** through **58** are received within receptacles **61** through **68** of upper plate **60** and are secured therein by a plurality of fasteners **69**. An on/off switch **59** provides the user with direct manual control of the power-up of the fountain. Once again, lamp assemblies **51** through **58** are set forth below in FIGS. **8** and **9** in greater detail. However, suffice it to note at this point that each of lamp assemblies **51** through **58** receives and supports an electric lamp preferably of the type generally referred to as a "flood light or spotlight" which function to provide beams of light directed upwardly from lamp assemblies **51** through **58**.

Fountain **10** further includes a colored lens assembly **40** having a plurality of generally convex transparent colored lens **41** through **48**. Lens **41** through **48** are preferably formed of color tinted molded plastic material and are joined at their respective edges to form a single one-piece lens assembly. It will be apparent from examination of FIG. **1**A that colored lens assembly **40** is formed of a plurality of lenses **41** through **48** each shaped as shown in FIG. **11** and each configured to maintain lenses **41** through **48** in alignment with lamp housings **51** through **58** when housings **51** through **58** and lenses **41** through **48** are assembled within receptacles **61** through **68** and secured to upper plate **60**. Once assembled, lenses **41** through **48** provide individual colored light lens for each of the lamps within lamp assemblies **51** through **58** respectively. A plurality of fountain nozzles **20**, **21** and **22** are assembled to upper plate **60** by a plurality of threaded fasteners **33**, **34** and **35**. Nozzles **20**, **21** and **22** each include respective nozzle apertures **23**, **24** and **25**. Nozzles **20** and **22** utilize a single nozzle aperture while nozzle **21** utilizes a "sprayhead" configuration having a plurality of apertures formed therein. Nozzles **20**, **21** and **22** further include respective nozzle tubes **30**, **31** and **32** which are received within apertures **17**, **18** and **19** of upper plate **60** respectively. A plurality of threaded fasteners **33**, **34** and **35** are positioned on the underside of upper plate **60** and threadably engaged the portions of nozzle tubes **30**, **31** and **32** extending through apertures **17**, **18** and **19** to secure nozzles **20**, **21** and **22** in place.

Distribution drive unit **70** includes a gear drive **71** supporting a drive motor **73**. Motor **73** is coupled to an output drive **72** by a plurality of drive gears within gear drive **71** (not shown) which are fabricated in accordance with conventional fabrication techniques. Thus, when drive motor **73** is energized, power is transmitted through the gears within gear drive **71** to rotate drive shaft **72**. The function of distribution drive unit **70** is described below in greater detail. Suffice it to note here that distribution drive unit **70** is used to direct water flow between nozzles **21** through **22**. A control module **75** includes electronic control circuitry which is operative to control the various light and spray functions of fountain **10**.

With specific reference to FIG. **1**B, fountain **10** includes a lower housing **100** defining a generally hemispherical shape having an upwardly open interior cavity **101**. Lower housing **100** further defines a plurality of apertures **110** within its hemispherical walls and a center aperture **102**. Center aperture **102** is received upon a water supply pipe **103**. Supply pipe **103** is coupled to a source of pressurized water within the host fountain or pool and thus is coupled to the existing pump system. As a result, fountain **10** does not require a pump of its own in the embodiment set forth in FIGS. **1**A and **1**B. The upper end of supply pipe **103** extending through center aperture **102** is joined to a conventional coupler **104**. An on/off water flow valve **111** includes an input **112** coupled to supply pipe **103** by coupler **104** and an output **113**. Valve **111** further includes an electrical input connection **114** which is coupled to control module **75** (seen in FIG. **1**A) by conventional wiring (not shown). Output **113** is joined to a coupler **115** which in turn defines an upper flange for receiving the lower portion of a nozzle flow distributor **120**. Nozzle flow distributor **120** is set forth below in FIGS. **2** and **3** in greater detail. However, suffice it to note here that distributor **120** defines a single input **121** coupled to the output flow of valve **111** and coupler **115** together with a trio of water flow outputs **122**, **123** and **124**.

Fountain **110** further includes a plurality of nozzle feed tubes **135**, **136** and **137** which are coupled to distributor outputs **122**, **123** and **124** respectively. A plug receptacle **125** receives power plug **107** and is operatively coupled to control module **75** (seen in FIG. **1**A). Plug **107** is coupled to power cord **106** which in turn supports an input plug **108**. The latter is joined to a convenient power supply **105** which will be understood to comprise a convenient output of conventional operative electrical power.

An upper housing **130** defines a generally cylindrical shape having a generally cylindrical interior cavity **131**. Upper housing **130** further defines an upper flange **132** and a seal rim **133**. A resilient circular seal **138** resembling a large "O-ring" is received upon upper flange **132** and is generally located upon flange **132** by seal rim **133**.

Thus, with simultaneous reference to FIGS. **1**A and **1**B, fountain **10** is assembled by initially placing lower housing **100** upon supply pipe **103** extending through center aperture **102**. Thereafter, power cord **106** is passed through a convenient aperture in lower housing **100**. Next, coupler **104** is joined to supply pipe **103** afterwhich valve **111** is secured to coupler **104**. Coupler **115** is joined to output **113** of valve **111** afterwhich input **121** of distributor **120** is joined to the upper flange of coupler **115**.

Upper housing **130** is positioned upon the upper edge of lower housing **100** and secured thereto. With upper housing **130** in place, nozzle feed tubes **135**, **136** and **137** are joined to distributor outputs **122**, **123** and **124** respectively. At this point, seal **138** is positioned about seal rim **133** and lies upon upper flange **132**. Thereafter, control module **75** is secured within upper housing **130** and, by conventional electrical wiring (not shown), is operatively coupled to power cord **106** as well as connection **114** of valve **111**. With module **75** in place, distribution drive unit **70** is secured within upper housing **132** such that drive shaft **72** is coupled to aperture **125** of nozzle flow distributor **120** (aperture **125** better seen in FIG. **2**). With module **75** and distribution drive unit **70** secured within upper housing **130**, electrical connection is made between drive motor **73** and control module **75** using conventional wiring and connection techniques (not shown). With housing **130** in place, upper plate **60** is positioned upon seal **138**, rim **133** and upper flange **132** and is secured thereto by a plurality of threaded fasteners **69**. Lamp assemblies **51** through **58** are positioned within lamp receptacles **61** through **68** respectively and secured therein. Electrical connection is made between control module **75** and lamp assemblies **51** through **58** utilizing a plurality of seals (not shown). With lamp assemblies **51** through **58** in place within receptacles **61** through **68**, lenses **41** through **48** of colored lens assembly **40** are positioned upon the upper surface of upper plate **60** such that lenses **41** through **48** overlie the upper portions of lamp assemblies **51** through **58**. Lenses **41** through **48** of colored lens assembly **40** are secured to upper plate **60** to define a space between the bottom edges of lenses **41** through **48** (such as space **79** seen in FIG. **4**) which allow cooling water descending from the spray nozzles unto plate **60** to flow into the lamp receptacles.

Nozzle feed tubes **135**, **136** and **137** are positioned within apertures **17**, **18** and **19** and secured to upper plate **60** by attachments **33**, **34** and **35**.

Because of the alignment provided between apertures **17**, **18** and **19** and nozzle feed tubes **135**, **136** and **137** respectively, the attachment of upper plate **60** to upper housing **30** allows nozzles **21**, **22** and **23** can be press fitted to nozzle feed tubes **135**, **136** and **137**.

FIG. **2** sets forth a perspective view of nozzle flow distributor **120**. Nozzle flow distributor **120** provides a flow direction of water under pressure received at the input **121** between outputs **122**, **123** and **124**. As mentioned above, distributor **120** is operated by distribution drive unit **70** (seen in FIG. **1**A). More specifically, nozzle flow distributor **120** includes a housing **127** having an input port **121** on the bottom edge thereof. Housing **127** further supports an output plate **128** which is secured to housing **127** by conventional attachment such as sonic welding or adhesive attachment.

With output plate **128** secured to the upper flange of housing **127**, the rotation of flow control rotor **126** selects the water flow path between input **121** and a selected one of outputs **122**, **123** and **124**.

FIG. **3** sets forth a perspective assembly view of nozzle flow distributor **120**. The operation of nozzle flow distributor **120** provides selective water flow distribution between a common input **121** and a trio of outputs **122**, **123** and **124**.

More specifically, nozzle flow distributor **120** includes a housing **127** having an input port **121** on the bottom edge thereof. Housing **127** further supports an output plate **128** which is secured to housing **127** by conventional sonic welding or adhesive attachment. Fasteners **150** secure nozzle flow distributor **120** to the underside of plate **60**.

Housing **127** further defines a three-lobed channel combination **140**, **141** and **142** all in communication with input **121**. Housing **127** further defines a trio of seal edges **145**, **146** and **147** between channels **140**, **141** and **142**. Distributor **120** further includes a flow control rotor **126** having a generally cylindrical outer surface **148** and defining a single channel **129** formed therein. Channel **129** extends partially through flow control rotor **126** and thus defines one open portion at its bottom and one open portion at one side. Flow control rotor **126** further includes a generally cylindrical upper portion which is received within aperture **119** of plate **128**. A pair of resilient O-ring seals **117** and **118** are received upon the upper portion of flow control rotor **126** to provide a liquid seal within aperture **119**. Flow control rotor **126** defines an aperture **125** at its upper end. As is better seen in FIG. **2**, aperture **125** is accessible from the upper surface of distributor **120** and receives drive shaft **72** of distribution drive unit **70** (seen in FIG. **1**A).

During assembly, flow control rotor **126** is positioned within housing **127** such that cylindrical surface **148** is in contact with one or more of edges **145**, **146** and **147** depending upon the rotational position of flow control rotor **126**. Thereafter, plate **128** is secured to housing **127** completing the fabrication of distributor **120**. It will be apparent that as flow control rotor **126** is rotated, the direction of fluid flow path provided by channel **129** is selectively chosen between lobes **140**, **141** and **142**. This resulting flow is, as a result, selectively coupled between input **121** and a selected one of outputs **122**, **123** and **124**.

FIG. **4** sets forth a partial section view of fountain **10** showing the structure of nozzle **21** in a press fit and the water cooling apparatus utilized in providing cooling of the lamp housings within fountain **10**. It will be apparent to those skilled in the art from the descriptions above that the section view of FIG. **4** shows the structure of receptacle **64** having lamp housing **54** supported therein. However, it will be equally apparent to those skilled in the art that lamp receptacles **61** through **68** as well as lamp assemblies **51** through **58** (seen in FIG. **1**A) are identical in structure and fabrication. Thus, the descriptions provided in conjunction with FIG. **4** are equally applicable to lamp assemblies **51** through **58** and lamp receptacles **61** through **68**.

More specifically with reference to FIG. **4**, fountain **10** includes an upper housing **130** which supports an upper plate **60** in the above-described attachment. Upper housing **130** defines an upper flange **132** which supports a resilient seal **138** and which forms an attachment to upper plate **60**. A lamp receptacle **64** is integrally formed within upper plate **60** and is in communication with the water present within upper housing **130** in the manner described below. Lamp assembly **54** which supports a conventional lamp **81** is supported within lamp assembly **54** and is secured within a water tight environment in the manner described below. Suffice it to note here that the heat generated by lamp **81** is communicated to the outer surface of lamp assembly **54** and is transferred to cooling water flowing within cooling space **82** between the interior surface of receptacle **64** and the outer surface of lamp assembly **54**.

FIG. **4** also shows nozzle feed tube **136** coupled to nozzle **21** in a press fit as described above. Nozzle **21** includes a plurality of spray apertures **24**. As is also described above, a plurality of colored or tinted lenses such as lenses **43** and **44** are supported upon upper plate **60** and overlie each of the lamp receptacles formed in upper plate **60**. The coupling of nozzle feed tube **136** to nozzle **21** allows water directed by nozzle flow distributor **120** (seen in FIG. **1**B) to flow upwardly in the direction indicated by arrow **80** and emerge as a spray from the upper portion of nozzle **21** via apertures **24**. The press fit attachment of nozzles **21**, **22** and **23** allows the user to remove and replace nozzles without disassembly of the fountain and without the use of tools.

The utilization of the water environment within which fountain **10** is operative to provide cooling of the lamp assemblies within the present invention fountain provides a distinct advantage over other lighted fountains. The presence of cooling water in proximity to the sealed lamp assemblies allows greater time of operation without damage to the unit. It also facilitates the use of higher wattage lamps to achieve a more dramatic effect due to this increased efficient cooling.

FIG. **5** sets forth a section view of an alternate embodiment of the present invention generally referenced by numeral **160**. Fountain **160** is substantially identical to fountain **10** shown and described above with the differences being found in the utilization of an on-board pump **163** within the interior of fountain **160**. Thus, fountain **160** is independently powered in that it does not require coupling to an external source of water flow under pressure but rather generates its own pressurized water flow. In all other respects, however, fountain **160** is substantially the same as fountain **10** described above.

More specifically, fountain **160** includes a lower housing **161** joined to an upper housing **162**. An upper plate **190** is secured to the upper edge of upper housing **162** to complete the housing enclosure for fountain **160**. Fountain **160** further includes a lens assembly **170** having a plurality of individual colored lenses **171** through **178** (seen in FIG. **7**). Fountain **160** further supports a plurality of nozzles such as nozzles **167** and **168**. Upper plate **190** is fabricated in the manner shown in FIG. **7** and is identical to upper plate **60** shown in FIG. **1**A. Thus, upper plate **190** defines a plurality of lamp receptacles **191** through **198** (seen in FIG. **6**A) which receive and support a plurality of lamp assemblies **181** through **188** (also seen in FIG. **6**A).

Fountain **160** differs in the utilization of an on-board pump **163** together with a counterweight **164** and a lower weight **154**. In addition, lower housing **161** differs from housing **100** shown in fountain **10** in that lower housing **161** supports a plurality of downwardly extending legs **210**, **211** and **212** (leg **210** seen in FIG. **6**C). Further, legs **210**, **211** and **212** support respective feet **213**, **214** and **215** (seen in FIG. **6**C).

The use of an on-board pump **163** requires that a different coupler **159** be utilized in coupling the output water flow of pump **163** to nozzle flow distributor **166**. Flow distributor **166** is identical to distributor **120** set forth above in FIGS. **2** and **3**. Coupler **159** is required to properly direct water flow from pump **163** to the input of flow distributor **166**. Fountain **160** also utilizes gear drive unit **70** having motor **73** to operate flow distributor **166** in the manner described above. A power cord **165** couples a source of power **217** to the operative units within fountain **160** including control module **75**, pump **163** and the electric lamps within lamp assemblies **181** through **188** (not shown). This operative coupling will be understood to utilize conventional electrical wiring (not shown) which is employed in accordance with conventional wiring techniques.

A convenient operative benefit of fountain **160** is found in its ability to be placed upon a flat surface such as a patio or pool deck for service or storage. The buoyancy of fountain **160** allows it to float slightly above the surface of a pond or reflecting pool and thereafter operate to greatly enhance the aesthetic appeal of the area by providing lights and water flow in accordance with the user's preferences. An anchor and tether **158** is used to maintain the position of the fountain within its environment.

FIGS. **6**A, **6**B and **6**C taken together set forth a perspective assembly view of fountain **160**. It will be apparent to those skilled in the art that substantial portions of fountain **160** are similar or identical to the corresponding units set forth above in conjunction with fountain **10**.

More specifically with reference to FIG. **6**A, fountain **160** includes an upper plate **190** which defines a plurality of lamp receptacles **191** through **198**. Fountain **160** further includes a plurality of lamp assemblies **181** through **188** received and supported within receptacles **191** through **198**. A lens assembly **170** includes a plurality of individual colored or tinted lenses **171** through **178**. As described above in conjunction with fountain **10**, lens assembly **170** is received upon and secured to upper portion of plate **190** such that lenses **171** through **178** overlie lamp assemblies **181** through **188** respectively. A plurality of nozzles **167**, **168** and **169** are secured to nozzle feed tubes **155**, **156** and **157** in the above-described press-fit attachment.

Fountain **160** further includes a control module **75** together with a counterweight **164**. Counterweight **164** is required to offset the weight provided by pump **163** (seen in FIG. **6**B). As mentioned above, pump **160** also includes a gear drive unit **70** having a motor **73** identical to the gear drive unit utilized in the above-described fountain. A seal **138** is secured beneath upper plate **190** when upper plate **190** is joined to upper housing **162** (seen in FIG. **6**B).

With specific reference to FIG. **6**B, fountain **160** includes a generally cylindrical upper housing **162** having an upper flange **179**. A plurality of nozzle feed tubes **155**, **156** and **157** are supported within upper housing **162**. Fountain **160** further utilizes a nozzle flow distributor **120** identical to the distributor set forth above and having an input **121** and a trio of outputs **122**, **123** and **124**. A pump **163** which is electrically operated under the control of control module **75** is coupled to input **121** of distributor **120** by a coupler **159**. A center weight **154** is positioned beneath pump **163** and distributor **120** to further control the buoyancy and float level of fountain **160** within its water environment. A power cord **165** is utilized in coupling operative power to control module **75** (seen in FIG. **6**A).

With specific reference to FIG. **6**C, pump **160** includes a generally hemispherical lower housing **161** having a plurality of supporting legs **210**, **211** and **212** (legs **212** seen in FIG. **5**). A plurality of feet **213**, **214** and **215** are secured to the lower edges of legs **210** through **212**. An anchor fitting **216** is secured to the bottom center of housing **161**. A power source **217** is coupled to a power cord **165** which provides operative power for fountain **160**. As mentioned above, a center weight **154** is received within the lower center of housing **161** in the manner shown in FIG. **5**.

The operation of fountain **160** is substantially the same as fountain **10** set forth and described above with the difference being found in the utilization of an on-board pump in place of operative coupling to an external source of pressurized water flow which fountain **10** depends upon. In all other respects, however, the function and operation of fountain **160** is substantially identical to fountain **10** and the descriptions thereof will be understood to apply equally well thereto.

FIG. **7** sets forth an enlarged perspective assembly view of the upper portion of fountain **160**. As described above, fountain **160** includes an upper plate **190** defining a plurality of lamp receptacles **191** through **198**. Of importance with respect to the present invention is the further presence of a plurality of interconnecting cooling channels **221** through **228** which interconnect receptacles **191** through **198**. As mentioned above, receptacles **191** through **198** carry a flow of cooling water during the operation of the present invention fountain. This cooling water flow is of particular importance when the present invention fountain is operating to provide a plurality of colored light enhancements of the fountain sprays. Channel **221** connects receptacles **191** and **198** while channel **222** connects receptacles **191** and **192**. Similarly, channel **223** couples receptacles **192** and **193** while channel **224** couples receptacles **193** and **194**. In a similar fashion, channel **225** couples receptacles **194** and **195** while channel **226** couples receptacles **195** and **196**. Channel **227** couples receptacles **196** and **197** while channel **228** couples receptacles **197** and **198**. Thus, each of receptacles **191** through **198** is provided with a flow of cooling water which enhances the efficient and safe operation of the lamp assemblies within the present invention fountain.

FIG. **8** sets forth a section view of an illustrative lamp assembly. FIG. **8** shows the structure of lamp assembly **181**. However, it will be understood by those skilled in the art that lamp assembly **181** is substantially identical to lamp assemblies **182** through **188** of fountain **160** as well as lamp assemblies **51** through **58** of fountain **10** (seen in FIG. 1A). Accordingly, the descriptions set forth in conjunction with FIGS. **8** and **9** will be understood to be equally applicable to the structures of the remaining lamp assemblies within fountains **10** and **160**.

More specifically, lamp assembly **181** includes a housing **244** forming a base **245** therein. Assembly **181** further includes a cover attachment **247** securing a clear protective lens **253**. A resilient seal **248** is captivated between cover **253** and the upper portion of housing **244** to maintain the water tight integrity of housing **244**. A conventional lamp **250** which preferably comprises a “spotlight” or “floodlight” is supported within the interior of housing **244** by a socket **251**. A plurality of electrical connections are made to socket **251** through a water tight connector (not shown) which is fabricated in accordance with conventional fabrication techniques. Thus, as heat is generated by lamp **250** within the interior of housing **244**, heat is communicated to the outer surface of housing **244**. This heat is subjected to the above-described cooling water flow to carry heat away from lamp assembly **181** and maintain lamp **250** and lamp assembly **181** within the safe and efficient operating temperature range to avoid overheating and potential damage to the present invention fountain.

FIG. **9** sets forth a perspective assembly view of lamp assembly **181**. As described above, lamp assembly **181** includes a housing **244** having an upper edge which receives a resilient seal **248**. A socket **251** is secured to the lower portion of housing **244** and receives a lamp **250**. A lens **253** is positioned upon seal **248** and is secured thereto by an attachment **247**.

FIG. **10** sets forth a perspective top view of upper plate **190**. As mentioned above, upper plate **190** is substantially identical to upper plate **60** and thus the structure thereof will be understood to apply equally well to upper plate **60**.

More specifically, FIG. **10** shows upper plate **190** in a top perspective view which facilitates examination of the various elements of the present invention found therein. As mentioned above, upper plate **190** includes a plurality of lamp receptacles **191** through **198** interconnected with respective cooling channels **221** through **228**. As mentioned above, descending water spray flows into lamp receptacles **191** through **198**. The cooling channel water flow is exceptionally important to provide the lamp cooling function of the present invention. In order to protect the present invention fountain from potentially damaging operation in the event water flow sufficient for cooling is not present, one or more water level sensors **260** are positioned within a selected one or selected ones of channels **221** through **228**. The fabrication of water level sensors **260** utilizes conventional sensing units of the type readily available in the art. The present invention system is configured to terminate the operation of the lamps within the lamp assemblies in the event a low water level or absence of cooling water is sensed.

FIG. **11** sets forth a perspective lower view of a typical lens **171** showing the mounting apparatus used therein which secures lens **171** to plate **190**. It will be apparent to those skilled in the art that the structure shown for lens **171** and its cooperating receptacle **191** (seen in FIG. **10**) is identical to the individual lens and lens receptacles shown above in pumps **10** and **160**. Thus, the descriptions set forth herein in connection with lens **171** will be understood will be understood to be equally descriptive and equally applicable to the remaining lens set forth in fountains **10** and **160**.

More specifically, lens **171** includes a pair of downwardly extending spaced-apart flanges **85** and **86** together with a similar pair of downwardly extending spaced-apart flanges **87** and **88**. Lens **171** further includes a plurality of downwardly extending generally cylindrical posts **91**, **92**, **93** and **94**. With concurrent reference to FIGS. **10** and **11**, it will be noted that lens **171** is assembled to plate **190** by fitting flanges **85** and **86** into cooling channel **221** while fitting flanges **87** and **88** into cooling channel **222**. With this alignment, posts **91** and **92** are aligned with apertures **230** and **231** formed in plate **90** while post **93** and **94** are aligned with apertures **232** and **233** therein. Thus, lens **171** is simply press-fitted onto plate **190**. The spaced-apart fabrication of flanges **85** and **86** and flanges **87** and **88** together with their relatively short lengths insures that cooling water is able to flow through cooling channels **221** and **222**. As mentioned, the remaining lens are assembled within their respective lens receptacles in accordance with this fabrication.

FIG. **12** sets forth a front view of a remote controller **270** constructed in accordance with the present invention. Remote controller **270** operates utilizing the circuit set forth in FIG. **13**. Remote controller **270** includes a plurality of user operated buttons each of which is depressible to input a particular remote control command to be processed by the circuit set forth in FIG. **13**.

More specifically, remote controller **270** supports a main power button **281** together with a pump on/off button **271** and a light on/off button **272**. Controller **270** further includes a transmission indicator light **289** and low pump button **273** and a high pump button **274** which are operative to set the operating level of the pump within the present invention fountain. Remote controller **270** further includes a nozzle select button **275** which is operative to increment the water distribution apparatus within the present invention fountain to the next nozzle in the operative sequence. An auto pump input **276** provides for the operation of the pump within the present invention fountain in accordance with a predetermined sequence of pump level changes.

A pair of time adjusting buttons **277** and **278** allow the time of pump operation to be adjusted. An auto lights **279** provides a command to the present invention fountain which causes the lights to be selectively changed in accordance with a predetermined sequence. A time select button **280** is utilized in selecting the time of operation of the present invention fountain. A plurality of condition indicating lights

282, 283, 284, 285 and 286 provide visible indication of the current timer setting for the operation of the present invention fountain.

Thus, utilizing remote controller 270, the user is able to access the operative circuitry set forth in FIGS. 13, 14 and 15 below to control the operation of the present invention fountain from a remote location.

In operation, the user initially operates 281 to turn on the system power for remote control. If no action is taken within two minutes, the system again returns to an off condition. Next the user utilizes button 271 to turn on the pump system and cause water to spray. The default condition for pump operation in the absence of selection is a cyclical routine of changing water spray. However, utilizing button 275 the user is able to select the water spray nozzle to be driven. Next, the user operates buttons 273 and 274 to adjust the height of water spray. Thereafter, buttons 277 and 278 are utilized in setting the time of operation. The default condition for the timer is one hour. During time set using time increase and decrease buttons 277 and 278, lights 282 through 286 indicate the timer setting. Once the time has been set, the fountain system cycles through a shut down and a turn on to indicate time has been set. Thereafter, the user utilizes button 272 to turn the lights of the fountain on or off. The default condition for light activation is a periodic light cycle. The user then employs button 279 to sequence through the available lights. Thereafter, the user presses button 280 to select the desired lights to be utilized. At this point, the system is completely set by remote control. Operation may be further changed by utilizing any of the foregoing control buttons to provide further input to the system using remote controller 270.

FIG. 13 sets forth the operative circuitry within remote control unit 270. Remote control unit 270 includes a microprocessor 290 constructed in accordance with conventional fabrication techniques and including an associated memory having a stored instruction set therein. Microcontroller 290 includes a plurality of input buttons 271 through 281 which function as described above in FIG. 12. Microcontroller 290 further includes a battery power source 291 and a power regulator 292. Regulator 292 provides a fixed operating voltage derived from battery 291 which is used to operate microprocessor 290 and RF transmitter 293. A plurality of light emitting diodes 282 through 286 function as described above in FIG. 12 to provide indication of timer settings.

FIG. 14 sets forth a schematic diagram of the main controller circuit for fountain 160. It will be recalled that fountain 160 utilizes an internal pump system rather than replying upon an external source of water under pressure as is the case with fountain 10. It will be further noted that the controller circuit of FIG. 14 utilized for fountain 160 is substantially the same as the controller circuit of FIG. 15 used for fountain 10 with the sole difference being found in the operative connection to pump motor control.

More specifically, a microprocessor 300 includes a power regulator 301 coupled to a source of operative 12 volt DC power (not shown). Microprocessor 300 is coupled to a radio frequency receiver 302 which in turn is coupled to a receiving antenna 303. Antenna 303 operates to receive remote control signals from remote control unit 270 (seen in FIG. 12). A plurality of input switches 303, 304, 305 and 306 are operatively coupled to microprocessor 300 to set input conditions for controller operation. In addition, a manual/auto input 307 is also coupled to microprocessor 300. Microprocessor 300 is further coupled to a plurality of indicator lights 313, 314, 315 and 316 which respond to operating condition of the controller to indicate the settings inputted by the user. Microprocessor 300 is further coupled to nozzle flow distributor motor 73 which, as is mentioned above, provides water flow selection between the plurality of fountain nozzles operative in the present invention fountain. Microprocessor 300 is further coupled to an internal pump motor 163 which is operative under microprocessor control to provide the water flow under pressure for the fountain nozzles of fountain 160.

FIG. 15 sets forth a schematic diagram of the main controller operative within fountain 10. As mentioned above, the main controller for fountain 10 shown in FIG. 15 is substantially identical to the main controller described above in FIG. 14 with the difference being found in the control of the external pump system utilized in fountain 10.

More specifically, a microprocessor 300 includes a power regulator 301 coupled to a source of operative 12 volt DC power (not shown). Microprocessor 300 is coupled to a radio frequency receiver 302 which in turn is coupled to a receiving antenna 303. Antenna 303 operates to receive remote control signals from remote control unit 270 (seen in FIG. 12). A plurality of input switches 303, 304, 305 and 306 are operatively coupled to microprocessor 300 to set input conditions for controller operation. In addition, a manual/auto input 307 is also coupled to microprocessor 300. Microprocessor 300 is further coupled to a plurality of indicator lights 313, 314, 315 and 316 which respond to operating condition of the controller to indicate the settings inputted by the user. Microprocessor 300 is further coupled to nozzle flow distributor motor 73 which, as is mentioned above, provides water flow selection between the plurality of fountain nozzles operative in the present invention fountain. Microprocessor 300 is further coupled to a pump output 320 and a control bus output 321 which provide operative control of the external pump motor of the host system to which fountain 10 is connected. This external pump system within the host environment is not shown but will be understood to be constructed in accordance with conventional fabrication techniques.

What has been shown is a novel improved multi-spray multi-light fountain suitable for use with existing high pressure water supplies of a host pool or pond as well as suitable for use without the need of a pressurized water supply. The improved fountain provides simultaneous flow and light shows which have substantial aesthetic appeal to the user.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. Therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

That which is claimed is:

1. A floating fountain for use in a water environment such as a pool or pond, said fountain comprising:
- a housing defining an upper flange and an interior cavity;
- an upper plate secured to said upper flange defining a plurality of lamp receptacles;
- a plurality of lamp assemblies each having a lamp housing supported with said lamp receptacle and a lamp sealed within said lamp housing;
- a plurality of cooling spaces formed between said lamp receptacles and said lamp housings;
- a plurality of colored lenses and means for supporting said lenses above said upper plate in general alignment with said lamps, said colored lenses, said upper plates and

said means for supporting constructed to provide a cooling water flow path into said cooling spaces with said lamp receptacles;

a plurality of upwardly directed spray nozzles; and

means for directing water pressure to said spray nozzles to cause water to spray upwardly and descendingly.

2. The fountain set forth in claim **1** wherein said upper plate defines top surfaces generally about said lamp receptacles and wherein said means for supporting position said colored lens above said surfaces to provide a gap therebetween for form said cooling water flow path by which descending spray from said nozzles flows into said lamp receptacles.

3. The fountain set forth in claim **2** wherein said housing further includes at least one weight to create a buoyancy for said fountain such that said upper plate is slightly above the water surface of the pool or pond and wherein said upper plate defines a plurality of cooling channels interconnecting each of said lamp receptacles with its adjacent lamp receptacles.

4. The fountain set forth in claim **3** wherein said means for directing includes:

a nozzle flow distributor having a housing defining a single input and plural outputs each coupled to one of said spray nozzles and a movable flow control rotor; and

a motor and gear drive coupled to and rotating said flow control rotor.

5. The fountain set forth in claim **4** wherein said nozzle flow distributor input is coupled to an external source of pressurized water flow.

6. The fountain set forth in claim **4** wherein said means for directing includes an internal pump, having an output coupled to said nozzle flow distributor input, and a pump motor.

7. The fountain set forth in claim **5** further including a main controller operable to control said nozzle flow distributor, said lamps and said pump motor.

8. The fountain set forth in claim **7** wherein said main controller includes a remote control signal receiver and wherein said fountain further includes a remote controller for providing remote control signals to said main controller.

9. The fountain set forth in claim **5** further including a main controller operable to control said nozzle flow distributor, said lamps and said external source.

10. The fountain set forth in claim **9** wherein said main controller includes a remote control signal receiver and wherein said fountain further includes a remote controller for providing remote control signals to said main controller.

11. The fountain set forth in claim **4** wherein said nozzle flow distributor input is coupled to an external source of pressurized water flow.

12. The fountain set forth in claim **11** wherein said means for directing includes an internal pump, having an output coupled to said nozzle flow distributor input, and a pump motor.

13. The fountain set forth in claim **1** further including a main controller operable to control said nozzle flow distributor, said lamps and said pump motor.

14. The fountain set forth in claim **13** wherein said main controller includes a remote control signal receiver and wherein said fountain further includes a remote controller for providing remote control signals to said main controller.

15. The fountain set forth in claim **1** further including a cooling water sensor supported within said upper plate for turning said lamps off in the absence of cooling water at said lamp receptacles.

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